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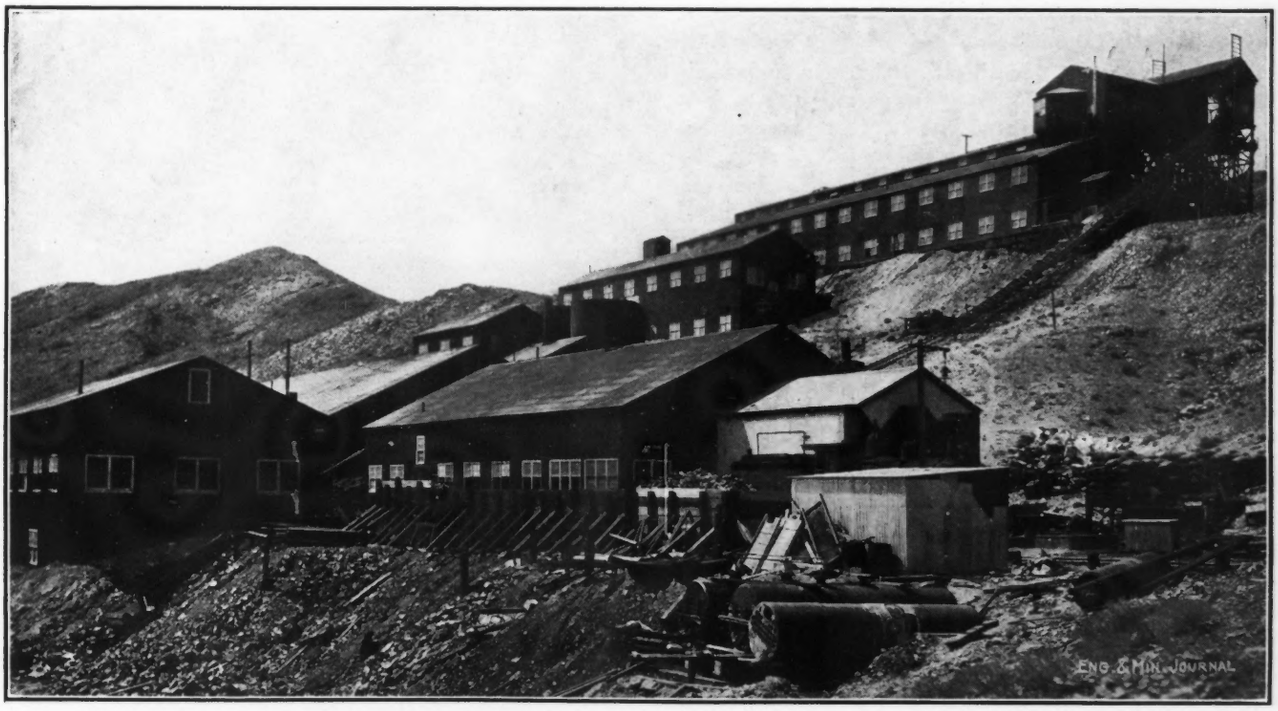
Operation of the Pittsburg-Silver Peak Mill

By Lyon Smith*

SYNOPSIS—The ore, a hard quartz, averages $5 gold per ton, and is delivered to the treatment plant by an aërial tramway, 14,000 ft. in length. The process involves crushing to 35 mesh with 120 stamps, followed by plate amalgamation and regrinding of the coarser sands. Classification is effected by settling and sizing cones. The sand is leached and the slimes treated directly in Merrill slimes presses. Zinc-dust precipitation is used. Mill operation costs $1.21 per ton treated.

The 120-stamp mill and cyanide plant of this company is situated at Blair, Esmeralda County, Nev. The Silver Peak railroad, 17½ miles long, owned and operated by the mining company, connects the camp with Blair Junction on the Tonopah & Goldfield R.R., 30 miles west of Tonopah. The plant was completed in the latter part of 1907 and since then has been in continuous operation.

The ore treated averages $5 per ton in gold, and is for the most part a hard, white, crystalline quartz. A large proportion of the gold is finely disseminated and in a free state, although it is also contained in scattered pyrite, and rarely, galena, which occurs sparsely through the quartz. Silver is present in part of the ore in a ratio of about 1 to 100, as compared with the gold. The quartz occurs in the form of overlapping lenses, intrusive into thin-bedded metamorphosed limestones, and frequently associated with similar lenses of alaskite. The general dip of the lenses and the lens zones is 30 degrees.



General View of Pittsburg-Silver Peak Mill, Blair, Nev.

Mill buildings, situated 2.7 miles from the main tunnel portal, are of modern construction with concrete foundations and steel superstructure, and occupy a gravity site contiguous to the railroad. All machinery is electrically driven from power furnished by the Nevada-California Power Co. The water supply is developed at

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Silver Peak and is pumped to the mill through 17,000 ft. of standard 6-in. pipe against a head of 550 ft.

Ore from the various mine workings is trammed to underground loading stations, from which it is hauled through a 3800-ft. main tunnel to the crusher building and upper terminal station of the aërial tramway. Electric locomotives are used, each hauling a 10-car train. Cars are of the rigid frame, single side-dumping type and have a capacity of 2½ tons each.

Crusher Building and Tramway

After weighing, the ore is dumped into a small reserve bin by an automatic side-dumping tipple, electrically actuated. Two men load, operate and discharge a 10-car train. The ore is drawn from the reserve bin as required to a No. 6 McCully gyratory crusher, the 3½-in. product from this machine gravitating to two No. 3 McCully gyratories with crushing heads set at 2½ in. The drive is from a 100-hp. Bullock motor, through line shafting, and the three crushers are brought to speed by a heavy friction clutch. The No. 6 machine has a maximum capacity of 50 tons an hour. The final product is elevated and passes the automatic sampler, while the reject goes by gravity to the 400-ton tramway storage bin.

The tramway, 14,000 ft. long, was built by the A. Leschen & Sons Rope Co. The fall from mine to mill is approximately 1600 ft., an Ingersoll-Sergeant two-stage, 10-drill compressor, connected to the main sheave through bevel gears, shaft and belt acting as a brake on the traction rope. The air developed is used in controlling the ore-bin gates and supplements the general supply furnished by the mine compressor.

As carriers there are 124 sheet-iron buckets supported from a two-wheel trolley by the typical triangular bucket hanger. Positive grips, placed 204 ft. apart, secure the hangers to the traction rope. The tramway is of straight-line type with no angle stations and passes one high ridge and several minor divides. Tension stations and intermediate towers are of wooden construction. The traction rope is a 1-in. special Hercules brand, and the track cables, 1⅜ and 1 in. diameter, for the loaded and empty buckets, respectively.

Buckets are automatically loaded and discharged by the Leschen patented system. Special basket carriers are used for transporting supplies of all kinds. These are loaded on a stub track and shunted by hand to the main tramway line.

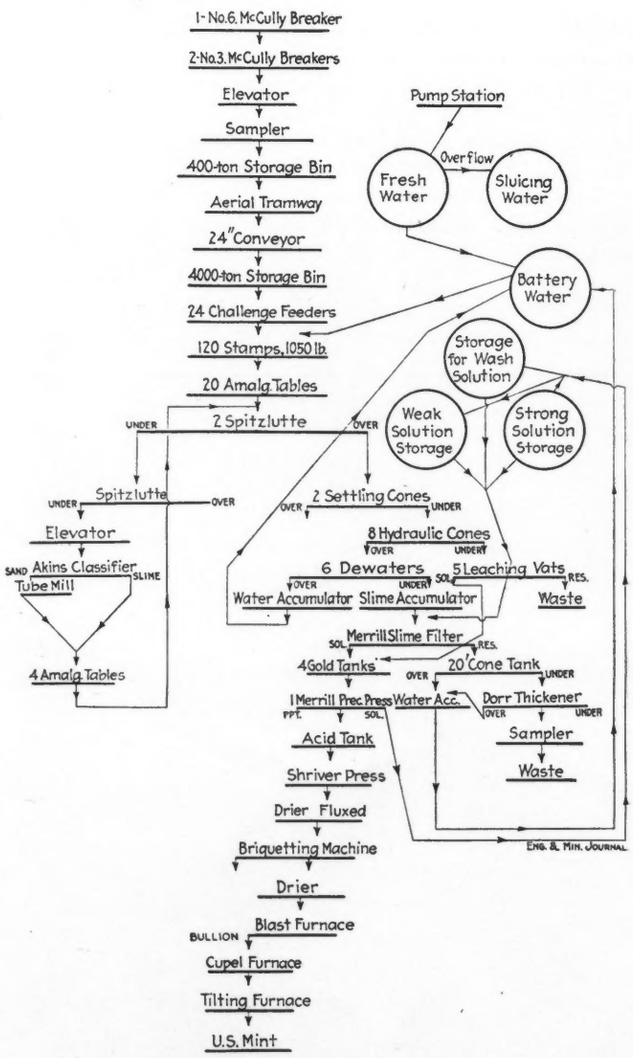
The normal capacity is 500 tons per 16 hr. This is equivalent to loading 74 buckets an hour, spaced at 48 sec., the line traveling at a rate of 250 ft. a minute. This ore weighs 91 lb. per cu.ft. and is free running. The bucket load is approximately 840 lb. and combined with the weight of the bucket and hanger complete averages a 1650-lb. unit.

Ore is dumped from the tramway buckets through a 4x3-ft. chute into a wooden container, which is provided with a feeder and discharges upon a 24-in. conveyor belt, running the entire length of the storage-bin building. An automatic double side-discharge traction dumper distributes the ore equally along the length of the bin. The bin is flat-bottomed and placed directly back of the stamps. It is 227 ft. long and has a capacity of 4000 tons.

Stamp Mill

From the bin the ore gravitates to 24 suspended Challenge feeders, which supply the 120 stamps. These weigh 1150 lb. each and drop 94 times per minute through 7 in. The weight is divided as follows: Stem, 491 lb.; boss-head, 300; shoe, 200; tappet, 157; total, 1148 lb. The working weight is about 1050 lb. The mortars, furnished by the Power & Mining Machinery Co., are of the narrow, rapid-discharge pattern. The battery frames are the usual three-post wooden construction.

The one-piece concrete battery block is surmounted by a 6-in. maple coping laid in tar, upon which is a single thickness of ¼-in. rubber belting. The mortars are held in place by eight anchor bolts, 2¼ in. in diameter. The bottoms of these bolts are enlarged and provided with a ½-in. keyway, which receives the gib key engaging the foundation washer.



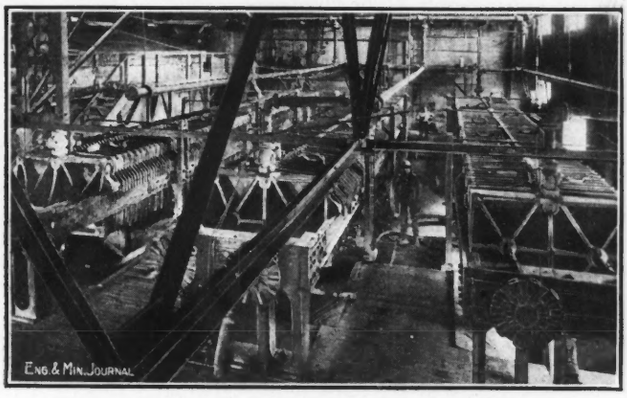
Flow Sheet of Pittsburg-Silver Peak Mill

Crushing is carried on in from 5 to 6 parts of water using a 5-in. discharge, which is kept constant by means of chuck blocks. The battery screens in present use are of two sizes, namely, 5x19-mesh Ton-Cap, No. 22 wire, with width of aperture 0.024 in.; and a similar Ton-Cap screen having a 0.021-in. width aperture. The stamp duty is 4.1 tons.

The stamps are driven in units of 20 by 50-hp. Bullock-type motors, placed beneath the ore bin and back of the stamps. A countershaft underneath the floor transmits motion to the two bull-wheels, which are controlled by rack-and-pinion belt tighteners. The camshafts are of mild steel and no trouble is experienced from breakage. The wearing parts are Adamantine chrome steel and cams are of the Canda self-locking type.

This unit of the plant was originally built as a 100-stamp mill. Two batteries of 10 stamps each, 5 right and 5 left, to correspond with the initial construction, were added later and a second set of amalgamation tables installed. The primary installation have the tables placed directly in front of the mortars and are used in conjunction with an 8-in. lip plate. Those installed later are placed 35 ft. from the mortars and on the next gravity plane of the mill, the pulp from the batteries being laundered to box distributors at the head of the tables.

The regular stamp-mill operating crew consists of six men, a batteryman and an amalgamator on each of the three shifts. In addition to this two men on day shift make all necessary repairs, and a plate man, assisted by the amalgamator, does all work pertaining to amalgamation. Simple repairs, such as putting on shoes, boss-heads, turning of stems, etc., are done on shift by the amalgamator and batteryman, the more extended repairs being left for the day repair crew.



MERRILL FILTERS AT THE PITTSBURG-SILVER PEAK MILL

The accompanying table gives the wear and cost of battery steel:

CONSUMPTION OF BATTERY STEEL

	Make	In.	Lb.	Days Wear	Cost per Lb.	Cost per Ton Milled
Shoe	Chrome	10½	200	87	$0.04895	$0.0274
Die	Chrome	8½	156	104	0.04895	0.0179

AMALGAMATION AND CLASSIFICATION

Outside amalgamation is practiced. Each table is composed of four copper sheets with a total area of 68 sq.ft., set on a grade of 1¼ in. to the foot. From the lip plate, 8x48 in., the pulp falls 2 in. to the head apron plate, the drop between the four table plates being ¾ in. Narrow splash boards are used at the head of each plate to retard the flow and give a longer contact with the amalgamated surface.

The plates are dressed once a shift and the head apron plates cleaned up each morning. On account of the low grade of the ore, it is not practical to keep the plates "close," and a light dressing with a whisk broom every eight hours keeps them in better condition than would a removal of amalgam. The lip plates are scraped close every 10 days or two weeks while the 3-ft. plates are allowed to build up until a part of the amalgam may be removed without leaving the surface in a hard and glassy condition.

Extending across the foot of each table are sand boxes, 8 in. wide and 10 in. deep, from which the sands are removed each week. These sands are treated in a 5-ft. pan, together with the material periodically cleaned up from the amalgamation traps below the sand boxes. After cleaning and air pressing, a 38% gold amalgam is delivered to the refinery. The recovery by amalgamation ranges from 55 to 60%.

From the stamp mill the pulp is conveyed to the cone department in two wooden launders, 12 in. wide and 8 in. deep, set on a grade of 1⅛ in. to 1 ft. The launder bottoms are lined with ¼-in. steel plate and are provided at the discharge end with screen boxes. A circular sump, 3 ft. in diameter by 4 ft. deep, provided with a baffle board and adjustable gates, equalizes the feed to two dewatering cones, 8 ft. in diameter at point of overflow with sides sloping at 50°.

The spigot discharge is delivered to a battery of eight hydraulic cone classifiers, the combined overflow from both sets of cones passing to a distributing sump and thence to a series of six cone-bottomed dewatering tanks. The underflow from the hydraulic classifiers, which forms the leachable portion of the pulp, passes by launder to the sand plant. The overflow from the cones is treated in Merrill automatic-sluicing slime presses. Separate treatment of the sand and slime is later described.

REGRINDING

The regrinding plant was installed in June, 1912. Prior to this time the material remaining on 80-mesh, amounting to from 52 to 60% of the whole, contained 85 to 90% of the total value in the sand residue from the leaching plant.

SCREEN ANALYSIS OF SANDS RESIDUE

	Mesh	Per Cent.	Value
On	40	22.82	$1.83
	60	29.32	1.00
	80	10.05	0.80
	100	10.47	0.59
	150	7.75	0.28
	200	10.72	0.18
	200	8.87	Tr.

At present three classifiers of modified spitzlutte type remove from the stamp-mill pulp about 50 tons a day of the coarsest sand. This is returned by means of a 40-ft. bucket elevator, using 6x10-in. buckets to a 13-ft. Akins classifier, which feeds a 5x18-ft. Allis-Chalmers chain-driven tube mill. The slime product from the Akins classifier and the discharge from the tube mill undergoes amalgamation before being returned to the classifying cones. To increase the efficiency of regrinding, one battery discharges directly to the Akins classifier through a 4-mesh screen.

The tube mill, when installed, was lined with 4-in. silex blocks. This lining was short-lived, considering the duty of the mill. More recently the Komata lining has been adopted, and the No. 5 Danish flints, formerly used as grinders, replaced with selected mine quartz. Comparative figures as to consumed horsepower of the mill, and life and efficiency of the two types of liners cannot be definitely given. The silex with which the mill was first lined was of poor quality, and this largely accounts for its short life. Since the Komata lining has been

in use, the mill, by a better regulated system of classification, has handled from 10 to 15% greater tonnage. Thus the conditions under which the two types of liners operated have been so different that it is impossible to determine their relative efficiency. Screen analysis of the mill discharge is practically the same under both conditions.

The total saving by regrinding the coarser sand amounts to from $1200 to $1600 a month, the additional cost being 3.9c. per ton of ore milled, distributed into labor, 0.4c.; supplies, 1.5c.; power, 2c.; total, 3.9c.

Sands Treatment

The launder which conveys the sands from the cone department discharges to a series of 5 leaching vats, provided with annular launders, each 36 ft. in diameter by 11½ ft. deep. A tipple box diverts the flow to the particular vat which is filling with sands, where it is received by a distributor of the Butters type. Four pounds of lime to one ton of sand are added at the cone department. Until recently this lime has been crushed wet in a one-stamp battery through an 8-mesh screen. The method of crushing, however, proved unsatisfactory. In was found that the sand charges in the leaching vats gave up their alkalinity in a comparatively short time. Several methods of adding the lime were tried out and the various results noted. At present the lime, in units of 150 lb., is spread evenly over the bottom of a lime box, provided at one end with an 8-mesh screen. A light spray of water is given and the lime allowed to stand for about 30 min. It is then turned several times with a shovel and gradually worked through the screen, 50 lb. an hour being the normal rate of addition. Pieces of lime rock and other portions of the lime that will not break up and partially slack by this method are removed and added to a pan grinder, which is used to deliver an emulsion of lime to the slimes.

The sand charges hold their alkalinity better under the present system of adding lime. The stamp delivered a certain amount of fine material, which could not be eliminated and which gave up its alkaline properties too quickly to be of much benefit in subsequent treatment. This fact was evidenced by the alkalinity of the displaced overflow from the vats during the filling period. Titrations have indicated a marked decrease in the protective alkalinity of the overflow water, while examination of the sands shows that the alkalinity is retained to a greater degree throughout the treatment period.

Treatment details present few departures from the usual practice. The sands, in charges of 480 tons each, is at first given 50 hours' contact with a 3-lb. cyanide solution. This is known locally as "strong solution." A 12-hour. combined air-and-drain period follows, at the expiration of which a 1.5-lb. solution (weak solution) is applied for 25 hours. The charges are washed with a barren low-strength solution for from 40 to 60 hours, and are "finaled" when the effluent assays from 12 to 10c. a ton in value. The treated charge is then sluiced out through one center and four side gates. Two men, using 3-in. hoses having 1⅛-in. nozzles, remove the charge in from 2½ to 3 hr., one ton of water to one of sands being used for this purpose.

Solution Changes

During the last 12 hours of strong- and the first 12 hours of the weak-solution periods, the effluent is air-lifted. In the first case the solution is returned to the top of the charge, in the latter, the strong solution displaced by the ongoing weak is transferred to the vat in which the sand is undergoing strong-solution treatment. This proceedure has materially decreased the tonnage of pregnant solution pumped to the precipitation press, and has appreciably cut down the consumption of cyanide, lime and zinc dust. No effect upon the extraction has been noted.

The vat and filter-press effluent flows to 4 iron tanks, each 26x10 ft. Two of these tanks receive all solution titrating above 0.8 lb. per ton in cyanide, the rest of the effluent passing to the other tanks. This latter solution is used, after being precipitated, as a wash on the sand charges, any excess in the amount required for this purpose being delivered to the sluicing water system. About 80% extraction is obtained in the sands plant.

Slimes Treatment

As previously noted, the combined overflow from the settling and sizing cones flows to a series of 6 cone-bottomed settlers or dewatering tanks, each 26 ft. in diameter and 24 ft. deep. The tanks are provided with annular launders for receiving the clear-water overflow, which is returned to battery storage tank by a 9x10-in. Aldrich triplex pump. The thickened slimes (sp.gr. 1.22 to 1.25) is drawn continuously from the apexes of the settling tanks and passes to a 20x16-ft. iron accumulator from which it is drawn off, as required, to the Merrill filters.

The three Merrill automatic sluicing pressure slimes filters are of the partial-filling type. Each press contains 86 frames, 4 in. deep and with a cross-sectional area of 25 sq.ft. Originally each press contained 64 frames, but at the time the regrinding apparatus was installed, the filtration plant was enlarged to its present size. The presses are filled from a 6-in. pipe line under a gravity pressure of 25 lb. The clear water issuing during the filling is returned by a 4-in. centrifugal pump to the water accumulator in the cone department and thence to the battery storage tank.

Filling is completed in from 20 to 25 minutes, depending upon the specific gravity of the entering slimes. The filtering medium is a light twill over which is placed a single thickness of No. 6 army-weave duck, which weighs from 22 to 24 oz. a sq.yd. The press schedule, as given herewith, is changed slightly from time to time, but is representative of normal operation.

CYCLE OF FILTERING OPERATIONS

Period	Time, Min.	Tons Solids	Tons Washwater
Filling	20 to 25		
Weak solution to waste (KCn 1.7, protective alkalinity 0.7)	20	4.2	
Weak solution to weak effluent gold tank	20	4.2	
Weak solution to weak pregnant gold tank	60	12.6	
Wash water to weak pregnant gold tank	30		10.9
Wash water to weak effluent gold tank.	20		7.3
Sluicing	60 to 80		
Total	Cir. 4 hr.	21.00	18.2

Charge tonnage, average 10 to 12 tons dry slime.
Per cent. extraction, average 92.

A description of the mechanical details of the Merrill press is not necessary. The distinguishing feature is the automatic discharging device, by means of which the cake, after treatment, is removed from the press. Water for this purpose is introduced under a pressure of 60 lb. per sq.in., the discharged residue approximating eight parts of water to one of solid. A large part of this water is recovered by settling in a cone-bottomed tank, 24 ft.

high and 20 ft. in diameter, the thickened product from which is fed to a 20-ft. Dorr thickener for further dewatering. This water is returned to the sluicing-water tank by an Aldrich triplex pump. Costs are as shown in the accompanying table:

COST OF FILTERING

	Per Ton Ore	Per Ton Slime
Labor, pressmen, $4.50 a shift	$0.030	$0.077
Supplies	0.057	0.148
Power	0.012	0.032
Totals	$0.099	$0.257

The item of power includes the operating cost of the following machines: Press solution pump, ⅔ return sluicing-water pump, ⅓ pregnant-solution pumps, 40% compressors and Dorr thickener.

PRECIPITATION

All solution from both sand and slime plants is precipitated by zinc dust in one Merrill, 30-frame, 52-in. precipitation press. The zinc dust is first fed to a small tube mill by a 12-in. belt, operated by floats and counterweights. The tube mill discharges to the suction pipes of two 5x7-in. Aldrich triplex pumps, which deliver the solution to the precipitation press through 125 ft. of 6-in. pipe. The press has a filtering area of 420 sq.ft. and storage capacity of 35 cu.ft. The filtering medium is a 10-oz. twill.

Before precipitation, all solution is clarified in a Kelly filter press, which is fed by one 2-in. centrifugal pump. This press was not purchased for clarifying purposes, but being available, was installed as an experiment and has been an aid to more efficient precipitation.

Little trouble is experienced from incomplete precipitation. From 0.2 to 0.3 lb. of zinc dust per ton of solution is used, depending upon the condition of the press. Immediately after cleaning, and until the filter cloths become coated with a slight excess of zinc dust, 0.3 lb. is used. This amount is lowered to 0.15 lb., after 500 tons of solution have been pumped.

Refining the precipitate at this mill has already been described at length[1], and will not be repeated here.

COSTS

The consumption and cost of the three principal chemicals used are as follows:

	Consumption per Ton Ore Milled, Lb.	Cost per Ton Ore Milled
Sodium cyanide	0.49	$0.11106
Lime	4.1	0.04202
Zinc dust	0.33	0.02496
Total		$0.17804

The mill requires 412 hp. for its operation, its cost being $7.35 per hp. per month.

The total operating cost for 12 consecutive months, during which time 172,482 tons of ore were milled, was as is shown in the accompanying table:

OPERATING COSTS AT PITTSBURG SILVER PEAK MILL

	Labor	Supplies	Power	Total
Stamping	$0.067	$0.092	$0.155	$0.314
Amalgamating	0.039	0.004	0.001	0.044
Tube milling	0.001	0.013	0.012	0.026
Neutralizing and settling	0.028	0.053	0.002	0.083
Leaching and sluicing	0.047	0.079	0.014	0.140
Filter-pressing	0.035	0.061	0.017	0.114
Precipitating	0.004	0.036	0.001	0.041
Refining	0.018	0.028	0.001	0.047
Assaying	0.016	0.012	0.003	0.031
Water service	0.024	0.016	0.027	0.067
Heating		0.003		0.003
Superintendents and foremen	0.067			
Total direct operating	$0.346	$0.397	$0.234	$0.977
Pro-rata of general expense	0.034	0.060		0.094
Suspense account		0.050		0.050
Total operating	$0.380	$0.507	$0.234	$1.121

[1]Refining at Silver Peak Mill, Lyon Smith, "Eng. and Min. Journ.," Mar. 22, 1913.

The operation of the Pittsburg-Silver Peak Gold Mining Co. is under the direction of William A. Bradley, general manager, to whom I am indebted for reviewing this manuscript. Charles A. Barr is mill superintendent.

Smelting at Lubumbashi

In a recent speech by Jean Jadot, chairman, at the meeting of the Union Minière du Haut Katanga, the following statistics were given out concerning smelting at Lubumbashi:

Production of copper from Jan. 1 to June 30, 1914: 42 days' work with one furnace; 122 days' work with two furnaces; 3 days' work with three furnaces, which corresponds to 295 days' work with one furnace; was 4520 tons of bar, containing from 96 to 97% of copper, and 100 tons of matte, containing 65%. The average production per day furnace was 15½ tons. [Since that date (June 30) the three furnaces have been working well and uninterruptedly.] The average cost of production in 1913 of one ton of copper on truck at the works was 800 f. The average cost for the first six months of 1914 was 778 f. This price was found to obtain during a period when work was comparatively reduced, if it be compared with that registered since three furnaces have been working. We had anticipated an average cost of 700 f. a ton. This cost will certainly not be exceeded by the average cost for the financial year 1914 now in progress, because during the second six months the production will be higher than that of the first six months, and will be recorded under more economical conditions. The probable production for 1914—we say probable, because we must always take into account occurrences of every kind—will be from 10,000 to 12,000 tons of copper instead of the 7000 tons in 1913. To the above-mentioned cost of production calculated on truck at the works must be added the cost of transport from Elizabethville to Antwerp, cost of handling sale, etc., which gives as the probable cost of production at Antwerp for 1914 in round figures about £40 a ton. Please note that this price does not include general European expenses carried to the profit and loss account, which amounted in 1913 to £18,000. We are engaged in realizing a vast program of enlargement of our metallurgical works at Lubumbashi, especially by the addition to the three existing furnaces of four new furnaces, which we hope to see working about June or July, 1915. If this hope be realized, our production for 1915 may be from 20,000 to 24,000 tons of copper. Naturally, this increase in production will have a very favorable effect upon the cost of production; the more the production increases the more the cost of production diminishes. The question which is of equal importance to us is the question of fuel. We have not ceased to give it our attention. The two batteries, each of 22 coke ovens, were fired, the first in December, 1913, and the second in March, 1914. Their capacity for production is 3000 tons per month. They insure the working of two furnaces, and fulfill our expectations. With a view to obtaining all the coke required to supply the new plant, we have entered into a very satisfactory agreement with the Wankie colliery. We have obtained a notable reduction on the transport rates for fuel on the Rhodesia railways. The question appears, therefore, to be settled on excellent terms.

The South African Gold Fields and Cyanide

Authoritative estimates which are now available place the amount of cyanide on hand at Johannesburg as being sufficient to meet the requirements for about two or three months, says the *Chemical Trade Journal*. During 1913 the quantity of cyanide purchased by the Transvaal gold mines amounted to 11,096,812 lb., valued at £463,561, about 75% of this being supplied by Germany. In the past the cheapness of the German product has discouraged British gas companies from making cyanide, it being more economical to market their hydrocyanic acid as prussiates. Now, however, that the supplies from Germany are cut off, the production of cyanide by British gas companies will be commercially possible, and all conceivable demands will be easily met.

Gold at Sesekinika, Ontario

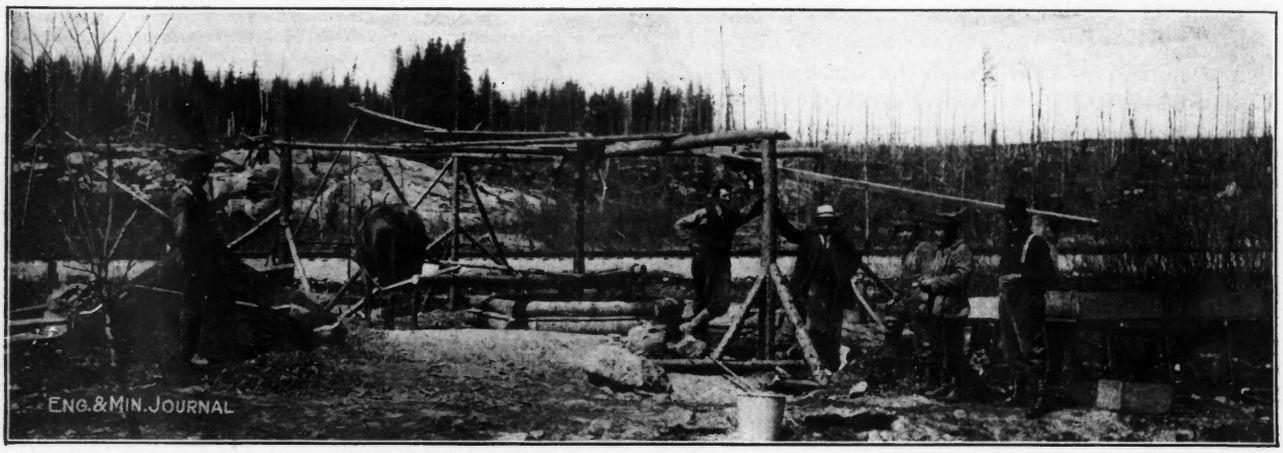
By J. T. Kerr*

Sesekinika Lake lies 400 miles north of Toronto and 60 miles southeast of Porcupine. It was the scene of a gold rush in June. The discovery claim has been staked and restaked many times in the last nine years; trenches had been cut and veins stripped for hundreds of feet yet no pay ore was found. During the Wolf Lake excitement N. N. Maloof staked the claim but did not start to work it until last February when he took a notion to put in a shot at a certain place where there was no vein and no mineral showing on the surface, merely country rock. After the blast, to his surprise, he found under a foot of capping decomposed rock, much of it like dark brown sand, in which were specks of gold.

As soon as the snow disappeared from the ground, an arrastre, similar to those used in Mexico, was built, and by means of this the separation of the gold from the rock and sand was commenced. The accompanying illustrations show the nature of the work and the arrastre.

*Sesekinika Lake, Ontario.

After the results of Maloof's discovery became known all the ground for many miles around was staked by those in the vicinity so that when men from the outside came in there was no chance for them to get ground near the discovery. So far little is known of the Sesekinika veins, too little to prophesy as to the immediate future of the region.



Washing Lode Quartz for Gold at Sesekinika, Ont.

Close View of Arrastre

Pit from Which Gold Is Taken

Increase in Borax Production

In 1913 the production of crude borate materials in the United States was 58,051 short tons, valued at $1,491,530, compared with 42,315 tons in 1912, according to the U. S. Geological Survey. All the borax in the United States is produced from ores derived from California, and mainly from a few mines in Inyo and Los Angeles counties, although a small quantity was produced in Ventura County.

Thus far there has been no output of borax from the potash property in the Searles Lake region, where the owners expect to obtain borax as a byproduct of the potash operations.

Cathode Potential in Copper Refining

By Kenneth S. Guiterman*

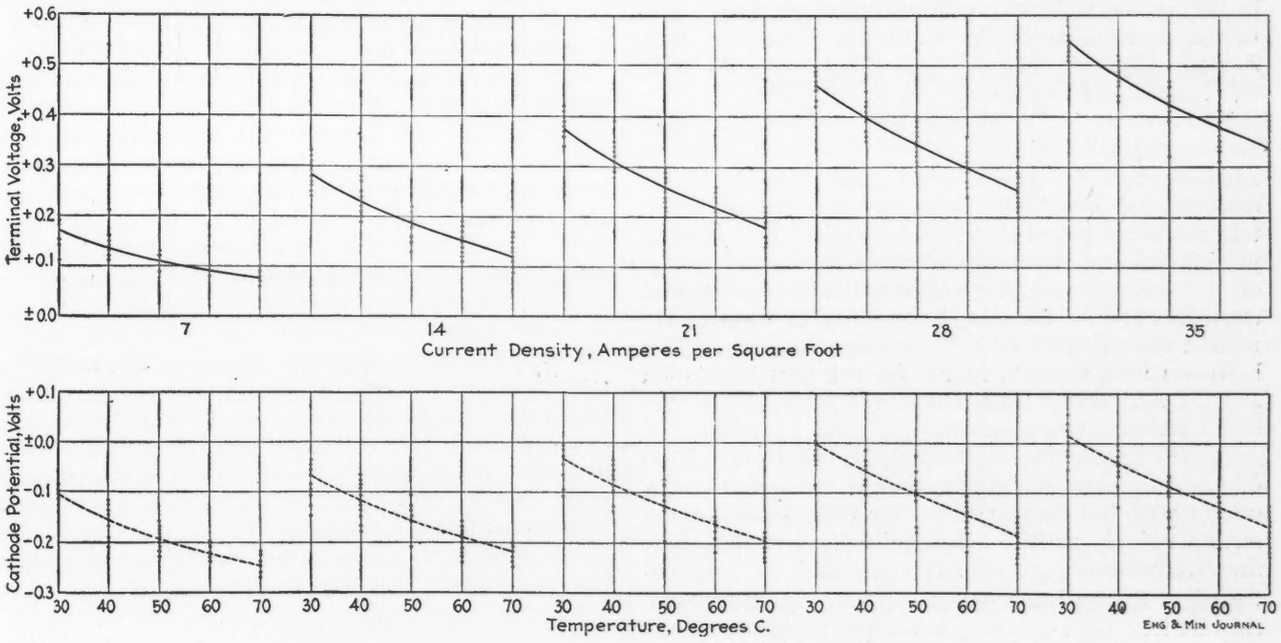
SYNOPSIS—An investigation was carried out which had for its object the exact determination of the cathode potential which obtained under various conditions of temperature, current density and purity of the electrolyte. By means of such measurements, it is possible to obtain a precise knowledge of the electrolyte reactions which take place at the cathode. Changes in the current efficiency are accompanied by concurrent changes in the cathode potential.

When any metal is precipitated by the electric current, it is necessary to employ such a terminal voltage which will insure the requisite potential at the cathode. It is also true in general that a loss in current efficiency is accompanied by a decrease in the cathode potential from the normal value.

The following experiments were carried out: (1) In every experiment the apparatus consisted of an electrolytic cell, containing an electrolyte of copper sulphate, to which some free sulphuric acid was added. The electrodes consisted of pure wire-bar copper at all times. (2) The electrolyte was kept in agitation by means of a rotating arm. The cathode potential was measured by comparison with a Weston element of constant voltage, in conjunction with a normal electrode composed of mercury-mercurous sulphate in a saturated water solution. (4) The Weston element maintained a constant potential of 1.019 volts. (5) The normal electrode had a potential of — 0.616 volt, as compared to that of a hydrogen electrode. (6) The temperature of the electrolyte in each experiment was varied as follows: 30° C.; 40° C.; 50° C.; 60° C.; 70° C. This variation occurred in successive stages, the cathode potential being measured at each temperature. (7) In each experiment and at each of the above temperatures, the current density of the cathode was varied successively as follows: 7; 14; 21; 28; 35 amp. per sq.ft. (8) In so far as it was possible, the composition of the electrolyte in regard to copper and free-acid content was maintained constant at approximately the following figures:

Cu—3.5%, equivalent to about 4 grams per 100 cc.
Free acid—11%, equivalent to about 12.5 grams per 100 cc.

In all experiments the contents of the electrolyte was recorded in terms of grams per 100 c.c. The volume of the electrolyte employed was uniformly 900 c.c. In all experiments which were made, there was used the pure electrolyte with the subsequent addition of certain impurities as follows: Glue, 0.005, 0.010, 0.020, 0.030 and 0.040 gram per 900 c.c. These amounts are the equivalent of ¼, ½, 1, 1½ and 2 times the amount of glue per cubic foot per day in practice. Salt, 0.005, 0.010, 0.020, 0.030 and 0.040 gram per 900 c.c., being the equivalent of ¼, ½, 1, 1½ and 2 times the weight of salt added per day per cubic foot under practical operating conditions. Arsenic, 4.5, 9.0, 13.5, 18.0 and 22.5 grams per 900 c.c. These amounts are the equivalent of approximately the following percentages in the electrolyte: 0.39%, 0.87%, 1.3%, 1.75% and 2.17%. Iron, ferrous, 4.5, 9.0, 13.5, 18.0 and 22.5 grams per 900 c.c., being equivalent approximately to the same above percentages as for the arsenic. Iron, ferric, 4.5, 9.0, 13.5, 18.0 and 22.5 grams per 900 c.c., equivalent to the same above approximate percentages in the electrolyte. Nickel, 4.5, 9.0, 13.5 and 18.0



Results of Tests for Determination of Cathode Potential

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grams per 900 c.c., being the approximate equivalent of 0.39%, 0.87%, 1.3% and 1.75% nickel content in the electrolyte.

Experimental

A total of 26 experiments was made in accordance with the plan above outlined. The results of these experiments are plotted upon the accompanying curve sheet, which needs little explanation for its interpretation. Voltage changes are plotted as ordinates, which are indicated at the left of the sheet. Temperature changes are represented by the abscissas, as are also shown. The curves in the upper part of the drawing represent the mean or average terminal voltages under the various conditions of temperature and current density. Those in the lower half of the drawing represent the mean average cathode potentials concurrent with the above terminal voltages. The former are absolute voltages, while the latter are relative potentials, as compared to the equilibrium potential of hydrogen, which is taken as equal to zero. In all of the experiments, the total cathode area was 0.094 sq.ft., and the distance between the electrodes was 1 in., surface to surface.

The results of these experiments are of the highest importance, inasmuch as they serve to confirm the truth of the figures, which are obtained upon the larger scale in the experiments in the tanks (cf. Eng. and Min. Journ., Aug. 22, 1914, p. 338). The curves illustrate this in most excellent manner.

In order that full importance may be attached to these curves and their significance clearly understood, it may be advisable here to explain briefly the meaning of the cathode potential. There exists for every element a certain minimum potential, which is required if it is to be precipitated or evolved at the electrode during the passage of the electric current. Under ordinary experimental conditions and for the sake of simplicity, it is customary to take the potential of hydrogen as zero (0.0). This basis has been assumed in the present experimentation and the equilibrium potentials of the other metals have been referred to this standard.

Those elements whose potentials lie below that of hydrogen are, therefore, negative, while those requiring a greater potential than hydrogen for their deposition are correspondingly positive. Lying in the first class with negative potentials are copper, silver, gold, etc.; the potential of copper being $-e_h: -0.308$. In the second class lie iron ($e_h: +0.66$), nickel ($e_h: +0.60$), etc.

In a consideration, therefore, of the question of the variation of current or ampere efficiency, the question naturally arises: What causes are likely to occasion such changes? The answer to this question is extremely simple. Variations in current efficiency can be caused by one of two things; that is, either by causing the cathode potential to rise so high as to produce an evolution of hydrogen at the cathode, or by occasioning the potential to fall so low that the equilibrium potential required for the deposition of copper is not exceeded. In the latter case the current efficiency would be zero as far as the deposition of copper is concerned and this condition is therefore of little interest in the present discussion. The problem thus resolves itself into a determination of the conditions under which the relative cathode potential may change from a negative to a positive value.

In this consideration there is still one other factor which is of the greatest importance, namely, the one which is known as the overpressure of hydrogen. This is of moment only in so far as it permits or causes the evolution of hydrogen when its equilibrium potential is exceeded. As a consequence of this factor alone, it becomes possible to precipitate such metals as cobalt, nickel and zinc from acid solutions.

With this brief explanation, the interpretation of the curves shown becomes an easy matter. The important points determined may be summed up as follows:

With pure electrolyte it has been shown that under none of the conditions either of current density or temperature, was the equilibrium potential of hydrogen exceeded. In other words, under none of the above conditions did the cathode potential change from negative to positive.

The addition of glue in the proportions commonly used in practice (12 to 14 lb. per day per each 170,000 cu.ft. of electrolyte), caused the cathode potential to rise somewhat. An increase in the temperature of the electrolyte offsets this rise to a large extent. The equilibrium potential of hydrogen was exceeded, however, only at high current densities and with a cold electrolyte. Still further increases in the additions of glue are accompanied by continued small increases in the cathode potential.

Salt added to the electrolyte appeared to be without appreciable influence upon the cathode potential.

Additions of arsenic and ferrous iron to the electrolyte showed but a slight effect in causing the cathode potential to rise. This was expected from theoretical considerations alone. The addition of ferric iron to the electrolyte caused an immediate fall in the cathode potential, which was accompanied by a reduction of the iron to the ferrous state. Concurrent with the reduction of the iron, the cathode potential gradually resumed its normal value.

Under no conditions would it be possible for the iron to be alternately reduced and then reoxidized, for the reason that under ordinary practical copper-refining conditions the cathode polarization is always greater than that of the anode.

The addition of a strong cathode depolarizer, such as potassium permanganate, caused a drop in the potential equal to that caused by the ferric iron, thereby confirming the preceding statements.

The addition of nickel to the electrolyte was without appreciable effect upon the cathode potential.

Recapitulation

The average current efficiency obtaining in pure electrolytes is 95%. The average current efficiency with impure electrolytes containing approximately 2% arsenic and 1% iron in solution is also 95%. In other words, the presence of glue, salt, arsenic and iron in the electrolyte is without effect upon the current efficiency. The average current efficiency with impure electrolytes containing ferric iron is still 95%.

The presence of impurities in the electrolyte causes a slight increase in the cathode potential. The presence of a cathode depolarizer, such as a ferric salt or the permangante of potash, causes a momentary decrease in the cathode potential. At no time and under no conditions does the cathode potential fall below that value required for the deposition of copper. Only under extreme conditions of both high current density and low temperature of an electrolyte does the cathode potential rise

above the value required for the evolution of hydrogen (0.0) at the cathode.

Conclusions

In view of these positive results which have been obtained and which support in detail all theory on the subject, the following conclusions are reached: Under practical operating conditions obtaining in copper refineries, a maximum of about 95% current or ampere efficiency, as measured against the best grade of electrical galvanometer, may be obtained. Impurities in the amounts commonly met with in copper electrolytes, such as iron and arsenic, have absolutely no effect upon this efficiency, notwithstanding assertions to the contrary. An element capable of existing in two states of oxidation, for example, ferrous and ferric iron, does not follow a cycle of oxidation at the anode with alternate reduction at the cathode whereby current is consumed which would otherwise be of value in depositing our copper. The state of oxidation in which the iron exists is purely dependent upon the relative values of the cathodic and anodic polarizations.

Under the usual conditions obtaining in copper refining, the cathodic polarization predominates, which causes the iron to remain in the reduced ferrous condition at all times.

While the quality of the deposited copper, its electrical conductivity and its physical character may be affected by certain impurities in the electrolyte, the current efficiency is not altered at all. A loss in current efficiency in copper refining is a reflex solely of mechanical short-circuits both in and out of the electrolytic tanks themselves.

The White Pine Development

Houghton Correspondence

The White Pine mine, in Ontonagon County, Michigan, being opened by the Calumet & Hecla interests, continues to create astonishment in the nature of its development. Two weeks ago a most important discovery of an entirely new lode was made. This has not yet been explored, but the initial diamond-drill core showed a formation as rich in copper as that upon which the development work, to date, has been done. The lode was found 150 ft. back of the footwall and was discovered by purest chance. The drill core showed a wider formation than the original and its placement is contrary to all rules of geological conditions in the copper district. This fact is not of particular interest, in view of the fact that the White Pine mine itself is opened on a lode which is so different from anything previously discovered.

The White Pine mine now has over a mile of openings on good copper rock of a commercial quality. The narrow width of the lode, 18 in. to 5 or 6 ft., resulted in difficulty at the beginning of the work. This and continued faulting created some scepticism at first. But further development gave the miners a fairly accurate knowledge of how to find the lode when it "broke."

There never has been any milling problem of serious moment, general opinion to the contrary notwithstanding. The rock is a comparatively soft sandstone and the Calumet & Hecla, by experimenting at its plant at Lake Linden, demonstrated that it could recover 80% of the contents with ordinary milling machinery. The tables save most of the copper. The mill which the company now has in the course of erection undoubtedly will do better than 80%, possibly as high as 90%.

Underground work continues and by the time the mill is ready for operation the mine will be ready to furnish rock to its complete capacity. No. 3 shaft now has attained a depth of 1200 ft. and No. 4, 900 ft. A new boiler plant to furnish steam for hoisting at both of these permanent shafts is nearing completion.

To fully appreciate the possibilities of the White Pine property, it must be understood that the sandstone formation shows copper returns of close to 100 lb. per ton. This is five times better than the average secured from the rock of the Lake Superior copper mines today.

Every mining man who visits the White Pine is impressed with the absence of rich rock sticking out in bunches as in every rich mine opened on the conglomerate or amygdaloid lodes, and with the uniform content.

If the White Pine does what its most ardent admirers predict, it will show a copper output about half that of the Calumet & Hecla on a tonnage of 1000 daily. No official of the Calumet & Hecla can be induced to make any such predictions. In fact, the best they say is that their hopes are for a successful commercial proposition in the White Pine.

Magnetic Surveying on the Cuyuna

By J. E. Rotthaus*

On the Cuyuna range over an area of 50 miles long and of a width varying up to several miles, probably 3000 drill holes have thus far been put down. In the entire district there is not one surface indication of iron ore or of the associated rocks, the surface everywhere being covered with sand and drift. The presence of iron-bearing formation was discovered through the use of the dip-needle, and magnetic surveying, or "dip-needling" as it is usually called, rendered material aid in the early stages of exploration in the district. As the district has now been more or less thoroughly explored and mapped magnetically, not much of this work is now going on.

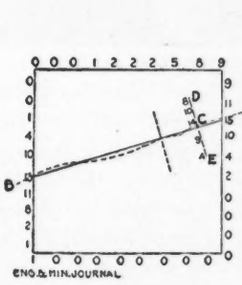

Fig. 1. A Forty Outlined by a Magnetic Survey

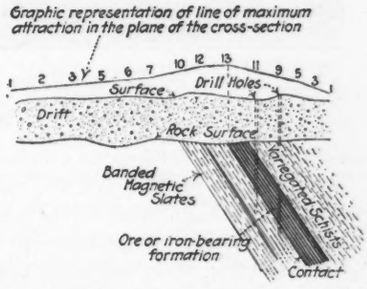

Fig. 2. Vertical Cross-Section at Right Angles to the Base Line

Such surveying work is carried on crudely in the Cuyuna district, as compared with Swedish practice, where great refinement is attained. In Sweden the ore is magnetite and the inclosing rock is absolutely nonmagnetic, while on the Cuyuna the conditions are somewhat reversed; the hematite is practically nonmagnetic, while

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the accompanying slates carry magnetite and attract the needle. Magnetic surveying is carried on in the Cuyuna field with but one object in view, i.e., to ascertain the absence or presence of the magnetic slates which prevailingly accompany the iron-bearing formation. This relationship is generally true on the South Range, but the absence of such magnetic slates on the richest known areas of the North Range left those deposits to be discovered by other methods.

There are a number of reasons why more delicate use of the magnetic-surveying instruments is impracticable in this district. The iron formation sometimes contains sufficient magnetic material to show a few degrees of attraction. The hematite and the slates are frequently interbedded, and are often buckled severely. Volcanic dikes sometimes bisect the formation, and these dikes usually contain a small amount of magnetite. The overlying drift may contain pieces of magnetic float of sufficient size to deflect the needle. These facts and their interpretation may mislead even the experienced dip-needlers; in fact, in many instances, any interpretation must be largely a guess.

The amateur is confronted with additional difficulties, such as deflections caused by electrical and magnetic storms, dulling of the bearing points, the partial loss of the magnetism of the needle, the presence of pipe lines or small quantities of scrap iron concealed in dumps, etc.; these errors, experience alone will enable him to interpret correctly and to avoid.

The use of magnetic-surveying instruments in the Cuyuna field has led to several refinements in practice. The Gurley "Miner's Dip Compass No. 341" seems to be the instrument most desired. Cuyuna field men first suggested the use of a bubble to insure perpendicularity of the compass when held in the hand. The instrument is first held horizontally, to determine the horizontal direction of the magnetic attraction. It is then held vertically in the plane of attraction and coincident therewith to ascertain the intensity of magnetic attraction. Fig. 3 shows the method of holding the instrument for the final reading, as the same is prescribed in many technical instrument catalogs and in some textbooks. Figs. 4 and 5 show the methods which Cuyuna range usage has shown to give the most accurate results; Fig. 5 is preferable. When holding the instrument as shown in Fig. 3, the slightest breeze may move the compass out of the perpendicular plane, while with the firm grasp shown in Fig. 5, the elbows being tightly pressed against the body, the likelihood of this is diminished. In Fig. 5 the bail or ring encircles the compass. This is left loose and free to swing and therefore acts as a plumb-bob in respect to one plane, while the bubble-tube is used to keep the instrument plumb as regards the other plane. Using the method of Fig. 3, these precautions are not properly observed.

Given, say, a 40-acre tract to work on, the engineer first takes readings at certain stated intervals, usually 100 paces (264 ft.) around the boundary. An idealized plat of the results would be as shown in Fig. 1. This shows the points of maximum magnetic attraction on the boundaries of the property to be at points *A* and *B*. Then, as a basis for drilling operations, a base line from *A* to *B* is staked off in 100- or 200-ft. intervals, and by taking readings perpendicular to this line, such as *C-D*, *C-E*, the sinuosities in the line of maximum attraction are accurately platted. This line then indicates, more or less closely, the location and trend of the magnetic slates which accompany the iron-bearing formation. In many instances, however, the iron content of the latter may be too low to make it commercial iron ore.

FIG. 3. UNSATISFACTORY METHOD OF HOLDING

FIG. 4. SATISFACTORY METHOD

FIG. 5. BEST METHOD

For drilling the tract, the base line is taken as a general guide. Cross-section lines are laid off at regular intervals, usually 300 ft., along this line. The drilling is started at a distance of probably 100 ft. from the base line on the hanging-wall side, which is usually the southeast, about as shown in Fig. 2, a cross-section. The questions of the location of drill holes, distance between cross-sections and the type of drilling, i.e., whether with angle or with vertical holes, are beyond the scope of this article. Many factors with which the dip-needler has no concern influence drilling operations.

Magnetic readings in the district run between 0° and 35° or 40°, and in rare instances run as high as 70°. It is difficult to state in a general way what readings might be considered favorable, except to say that exceedingly high readings are not especially so, since they generally indicate the presence of highly magnetic slates and are not an index to the value of the ore deposits, if there be any.

Mine Stores and What Mines Use--I

SYNOPSIS—The mine store is a department which has generally received little attention. A system of accounting and recording is given here, making a separate business of it, which should point toward a successful establishment. Lists of materials used in well known mines are given.

The first function of a mine store is to furnish the mine with a convenient source of regular supplies used at the mines, and the second, which grows in importance with the scale of operations, is to purchase and secure the delivery of supplies at the least cost. This is true because larger quantities of supplies may be bought or contracted for at one time, thereby securing more favorable terms. The location of a mine store must be central to all departments to insure a minimum cost of delivery from the store to the works. It is equally important that it be situated on a railroad spur so that all shipments of supplies may be received directly from the cars and stored without extra haulage. Undoubtedly, the best design for a mine store and warehouse is on the order of the long railroad freight sheds with a platform on all sides and doors spaced so that cars may be spotted at any particular part of the building. This arrangement will also permit delivery wagons and trucks to be backed up to any part of the building from which it is to get its load. This design not only gives the highest labor efficiency in handling supplies but also allows the storing of stocks in the most accessible manner. For fire-protection, the timber yards should be at some distance from the store and the oil-storage and powder magazine should be placed well away from other buildings.

Store as an Independent Department

The store should be run as independent department; in fact, it should be treated as a separate business altogether. It should have complete charge of everything pertaining to the buying, receiving, and local delivery of supplies. Timber framing is usually considered a separate department but it is a supply-distributing department and should be under the store management. The responsibility of delivering supplies and teaming should rest solely with the storehouse so it follows that it should have charge of stables and auto trucks used for general haulage. We then have in addition to the original of cost materials bought and freight thereon the following: cost of maintenance and repairs to store buildings and yards; insurance on buildings and stock; running expense of purchasing department; storehouse management, clerks and laborers; timber-framing mill operations; stable and auto-truck expense, including drivers and laborers. These charges must be added to the bills for supplies issued from the mine storehouse before we get the actual cost of supplies. It is indisputable that no mine is getting its actual cost of supplies when it does not include these.

It is quite a problem with some to know just how to make an accounting of these extra charges to supplies but they may be handled in a very simple way. To explain this method it is necessary, in a general way, to explain the bookkeeping system that must be employed at the mine's general operating office. Those who have had to wrestle with mine accounts and costs, not from the bookkeeper's point of view but to get the meat out of the figures, must agree that the main office is not the place to keep detailed costs. It is proper that it should have a file of all detailed cost sheets and reports but they should not originate there. It should attempt nothing more than a general accounting of funds passing through its hands. The division of accounts are subject to the operating units set apart by the management, but let us assume that the manager has divided his operations under the following heads; each with its own superintendent, organization and system of accounting:

Main accounts:
1—Mining, including accounts for separate mines.
2—Milling.
3—Selling.
4—Management and general operating office.

Sub-accounts:
A—Storehouse, including framing mill and stable.
B—Power plant and compressors.
C—Electrical department.
D—Mechanical department.
E—Railroad department.
F—General surface department.
G—Hospital department.

Accounts 1 to 4 inclusive make up the total cost of production after all monthly charges from the sub-accounts have been added. In paying vouchers the main office charges all payroll payments direct to the main accounts or sub-accounts as the case may be, but all payments for supplies, machinery and freights are charged to the storehouse. Power, of course, is charged to sub-account B. It is not the object of this article to discuss the details of the whole system of accounting so no reference will be made to these accounts only as they relate to the storehouse and distribution of supplies. The bills of the storehouse to the other departments must include the original cost of the material plus its freight charge, payrolls, its own department supplies, framing-mill expense, and stable expense. This additional expense for supplies must be distributed fairly to the various departments so that at the end of the month when the main operating office credits the storehouse with its bills to other departments the balance remaining will represent as closely as possible the actual cost of supplies in stock.

It is obvious at first glance that these additional charges cannot be accurately distributed to each department so that the total will check with actual expenditures without a great deal of work. It is also certain that anything like an equitable distribution must be based on the amount of supplies bought from the store. A little careful figuring will soon establish the ratio of these expenses to the original supply cost and a per cent. factor taken which if added to each bill will about balance these charges. A comparison of the inventory of stocks on hand with the balance standing on the books against the storehouse will serve as a way to regulate this per cent. factor. However, it is not necessary that all these additional charges should be cared for in this manner. The expense of the framing mill is added to the cost of framed timber and the charges for general hauling and teaming is billed out at an hour rate which represents the actual cost of teams and labor plus the per cent. factor. These adjustments and charges are looked after by the store manager.

It is very well on small operations to burden the storehouse department with making a detailed distribution of supplies among the working accounts of other departments. But in conducting operations on a large scale it is better to let these distributions be made by the clerks

of the various departments. In this case, the storehouse would only bill out goods to the accounts on the main operating books as stated. The authority for issuing supplies to and charging other departments should be in the form of a requisition signed by someone of authority in the department making the purchase. It is usually necessary, however, for such departments as the electrical, mechanical, and general surface department to purchase supplies which they will use for other departments. In this case, it is a great saving of time and bookkeeping to allow these departments to have such purchases charged direct to the department where the work is being done. For example; the electrical department purchases some electrical fixtures which it intends to use in the mill, it has the store charge it direct to the mill. the store requires it to "OK" the bill and designate where the fixtures were used in the mill. In this way the mill clerk will be able to make a proper distribution of the bill in his cost records. By following this practice, the bills rendered by the subdepartments to the other departments represent only their labor and necessary supplies for their own maintenance. This is best cared for at a shop-hour rate.

Under this system of organization the clerk of the mine department would receive a requisition from one of the foremen for a bill of supplies on which would also be stated the distribution. The clerk would in turn draw a regular storehouse distribution and to his copy of this attach the foreman's order. Upon delivery of the order by the storehouse, it sends a bill on which is given the requisition number. By referring to this number in his carbon copies, the clerk readily obtains the correct distribution of the supplies billed. It is a very simple matter then for the mine clerk to enter these bills under their proper headings on the monthly mine-supply sheet. At the end of each month he is furnished with a statement by the storehouse which should check with the total on his distribution sheet. The itemized supply distributions are handled by other department clerks in a similar manner. It might be well to mention here that the final mine and mill cost sheets containing labor, supplies, power, and department charges are not closed until a final check on department charges has been made through the main operating office. Copies of these sheets are then filed with the main office, thereby supplying more detail than would be possible under any other system.

Personnel of Store Organization

The personnel of a mine-store organization under a system of this kind would consist of a purchasing agent, storehouse manager, book-keeper and billing clerk, stock clerk, stable foreman, framing-mill foreman, and laborers. It is needless to say that the purchasing agent should be a good business man and familiar with the mining business. Few who have been connected with operations have not been caused more or less annoyance on account of the purchasing agent's unfamiliarity with the materials he was expected to purchase. Few orders originate with him but he is entrusted with the buying and delivery and final settlement of supply accounts. But in the purchase of staple supplies such as timber, explosives, fuels, oils, iron, steel, piping, cyanide, etc., he has a wide field to show his ability to save money, usually has the authority to purchase these in large amounts if he deems it necessary. The store manager should be a hustler who is familiar with the supply needs of all departments. He should make it a point to know the amount of stock he should carry. He should be the chief adviser of the purchasing agent in regard to regular stocks and above all know how to prevent delay in getting orders filled. He should have full authority over his department and subject only to the purchasing agent's orders, yet he should realize that the store is only run for the accommodation of other departments. All orders shoud go to the purchasing agent through the storehouse and all bills have the storehouse "OK" before final settlement, or return to the purchasing agent.

It should be the duty of the stock clerk to keep a daily record of stock on hand so that an inventory may be had at any time. One of the most convenient systems of the kind is a card system consisting of about 10x12-in. cards printed on two different colored boards. One color used for stock on hand and the other for deliveries. A card of each color is used for each separate item of stock. New stock received is promptly entered on the "stock on hand card" and all deliveries are entered daily on the "delivery cards." With this system, an ocasional checking with the stock in the storeroom will give a very accurate inventory at all times. The purchasing agent and store manager should make a regular study of these delivery cards to ascertain just what amounts of regular supplies are consumed. These records will guide them in making or contracting for the purchase of large stocks of staples in order to obtain the lowest cost. Buying in small lots means paying higher prices and freight charges. A study of these cards will undoubtedly show that some supplies are slow moving if not almost dead stock. To purchase them in lots to obtain anything better than the retail price would mean tying up money for an unreasonable time. In this case, the final cost would probably amount to double the retail price at a local store. If the mine is situated within easy reach of local stores the question of stocking the mine store with supplies other than those used in fair-sized quantities should be carefully considered. It has been thought that actual examples might be the best illustration, so the following lists of supplies, and other lists to be published in future issues of the JOURNAL, will give in detail all the supplies used at the Nevada Consolidated during a 10-mo. period, Miami Copper Co. during a 6-mo. period, New Jersey Zinc Co. during a 6-mo. period, and at the Hollinger Gold Mines during a 12-mo. period.

NEVADA CONSOLIDATED COPPER CO.

Mine Supplies for 10 Months in Steam-Shovel Mining; 2,376,966 Dry Tons Ore and 2,480,962 Cu.Yd. of Waste Mined

Fuel and Power	Tons	Lumber	Feet
Blacksmith coal	119	Rough fir lumber	282,638
Coal	35,000	Flooring, ceiling, etc.	39,625
Coke	13	Ami wood	47,148
		Molding, quarter round, etc	16,336

Explosives

Dynamite, 40%, lb.	1,667,050	Fuse, ft.	207,198
Grant ammonia powder, lb.	38,900	Blasting caps, No. 7	93,520
Black powder, cans	17,623	Electric exploders, 35 to 100 ft.	25,251
Praeposit powder, cans	4,966	Blasting machines	4

Dynamite consumption about 0.71 lb. per ton of ore. Black powder consumption about one can for every 105 tons of ore produced.

Oils, Greases, Etc.

Cylinder oil, gal.	4487	Candles, boxes	15
Summer and winter lubrication, gal.	3857	Gasoline, gal.	3446
Signal oil, gal.	264	Alcohol, gal.	49
Red engine oil, gal.	181	Turpentine, gal.	60
Compressor oil, gal.	40	Linseed oil, gal.	415
Black chain oil, gal.	7191	Whale oil, gal.	5
Thread-cutting oil, gal.	90	Cup grease, lb.	3342
Crude oil, gal.	186	Gordon's gear shield, lb.	1262
Kerosene, gal.	1843	Mica axle grease, lb.	25
		Graphite, lb.	321

Consumption of lubricating oils approximately 1 gal. for every 147 tons of ore; of lubricating greases, about 1 lb. for every 458 tons of ore.

Iron, Steel and Castings

	Lb.		Lb.
Bar steel	224,832	Iron castings	111,290
Sheet steel	25,492	Brass castings	25,649
Bar iron	88,965		

Consumption of iron, steel and castings about 1 lb. for five (5) tons of ore.

Pipe and Fittings

Pipe, ¼ to 6-in., ft.	18,600	Ball joints, 2- to 4½-in.	12
Copper tubing, 1¼-in., ft.	40	Stop and waste cocks.	10
Galvanized pipe, 10-in., ft.	30	Bib cocks	240
Valves, ¼-in. up	1169	Bib cock repairs, pc.	325
Bushings, ⅛- to 2-in.	1045	Cylinder cocks	18
Nipples, ⅛- to 2-in.	2037	Lock nuts	24
Unions, ⅛- to 3-in.	1260	Valve leathers, sets	10
Couplings, ⅛- to 4-in.	1402	Valve washers	2
Reducers, ⅛- to 4-in.	454	Valve nut and seat	1
Ells, ⅛- to 3-in.	742	Safety pop valves, 2-in.	6
Street ells, ⅛- to 3-in.	1161	Three-way hydrants	3
Pipe plugs, ⅛- to 3-in.	514	Expansion joint, 3-in.	1
Pipe caps, ⅛- to 3-in.	208	Faucet washers	300
Tees, ⅛- to 2½-in.	451	Faucet balls	404
Crosses, ¾- to 2-in.	11	Return bends, 1½-in.	4
Flange unions, 1½- to 3-in.	40	Water valve covers	6

Tools

Picks	131	Pick handles	564
Hammers, 928 lb.	131	18- and 36-in. hammer handles	1072
Ball pein hammers	76	Ax handles	41
Scoop shovels	77	Adze handles	18
Round point shovels	686	Shovel handles	292
C. S. saws	6	Saw handles	14
Crosscut saws	2	File handles	9
Axes	29	Track-jack handles	85
Foot adze	1	Screwdriver	1
Plow points	12	Hammer, farrier's	1
Monkey wrenches	97	Knives, farrier's	7
Trimo wrenches	53	Jaws, farrier's	1
Trimo wrench parts, pc.	916	Draw knives	2
Trimo movable jaws	52	Hacksaw blades	1879
Trimo springs	72	Hacksaw frames	7
Drop-forged wrenches	133	Water pails	6
Hand saws	5	Squares	2
Grading plow	1	Rules, 2-ft.	6
Track jack	1	Steel tape line	1
Jack-lever socket	1	Engineers' torch	36
Champion jacks	2	Torch burners	72
24-ton base ratchet jacks	2	Gasoline burners	3
Tackle blocks, 4-in.	4	Lanterns	149
Track-jack repairs, pc.	390	Lantern globes	1128
Road grader	1	Lantern burners	177
Timber carrying hooks	4	Acetylene burners	576
Chain hoist	6	Acetylene-lamp parts	106
Little giant air drill	1	Acetylene lanterns	16
Crankshaft power drill	1	Tinners' mallets	5
Ratchet bit braces	2	Galvanized tubs	38
Drill chucks	5	Tube cleaners	3
Drill-chuck keys	5	Shear block blades	14
Twist drills	668	Emery wheels	20
Shank drills	12	Plier pockets	2
Drill bits	18	Wheel-scraper boxes	4
Ship-auger bits	24	Loco. replacers, pr.	12
Extension bits	3	Counter brushes	9
Planer gear and pinion	1	Wheelbarrows	6
Steel balls	1700	Meat-saw blades	9
Vises	3	Glass cutters	6
Vise jaws	1	Mattocks	8
Faceplate	1	Manure forks	10
Rail clamps	4	Little Giant drill repairs, pairs	20
Brooms	198	Repairs for shop, pc.	383
Pliers, pairs	9	Rivet sets	2
Whisk brooms	14	Pipe dies	106
Scrapers	6	Pipe taps	117
Rail benders	3	Shearing machine	1
Asphalt rake	1	Valve grinders	2
Wire stable brush	1	Flue welder and dies.	1
Worm gears, rail bender	4	Saw-sharpening machine	1
Feather duster	1	Dust pans and brushes	2
Carpenters' chalk	576	Metal-workers' crayons	688
Paint brushes	115	Steel step ladder, 6-ft.	1

NEVADA CONSOLIDATED COPPER CO.

Supplies Used in Underground Mining at the Veteran Mine, 10 Months, Jan. 1 to Oct. 31, 1913; 216,794 Dry Tons of Ore Mined

Fuel and Power

Coal ..... 1065 tons Power ..... 120 hp. per 24 hr.

Lumber

Round mine stulls, lin.ft.	210,070	Flooring, ft. b.m.	1,048
Round mine lagging, lin.ft.	34,092	Oak, ft. b.m.	73
Common lumber, ft. b.m.	443,202	Quarter round, door stop, etc., lin.ft.	2,009
		Shaft guides, lin.ft.	1,000

Consumption of mine timber about 1.13 lin.ft. per ton of ore; of common lumber, about 2.05 b.ft. per ton of ore.

Explosives

Hercules 40% dynamite, lb.	130,750	Caps	168,750
		Fuse, ft.	505,700

Consumption of dynamite about 0.60 lb. per ton of ore; of fuse, about 3.9 ft. per pound of dynamite.

Oils, Greases, Etc.

Gear grease, lb.	1527	Renown engine oil, gal.	577
Cup grease, lb.	1584	Capital cylinder oil, gal.	206
Axle grease, lb.	25	Atlantic red oil, gal.	45
Graphite, lb.	10	Ario compressor oil, gal.	230
Candles, cases	1125	Transformer oil, gal.	15
Kerosene, gal.	228	Signal oil, gal.	18
Lard oil, gal.	12		
Linseed oil, gal.	19		
Black car oil, gal.	1568		

Consumption of lubricating oils about 1 gal. for 82.7 tons of ore; of lubricating greases about 1 lb. for 69 tons of ore.

Iron and Steel

Bar iron, lb.	9201	Pick steel, lb.	313
Tool steel, lb.	51	Forged steel, lb.	125
Ribbed steel, lb.	172	Cruciform steel, lb.	700
Drill steel, lb.	1829	⅞-in. drill steel, sets	12

Consumption of iron and steel about 1 lb. for 17.4 of ore.

Pipe and Fittings

Galvanized 8-in. pipe, ft.	2000	Reducers, ⅜x1 to 3x4 in.	29
Black iron pipe, ½- to 4-in., ft.	2585	Valves, ¾ to 1¼ in. (gate)	84
Nipples, ¼- to 4-in.	844	Valves, globes, ¼- to 2-in.	92
Couplings, ½- to 3-in.	278	Valves, 8-in. galvanized gates	7
Ells, ¼- to 4-in.	441	Valves, check, ½- to 3-in.	14
Ells, galvanized, 8-in.	40	Air cocks, ⅛- to ¾-in.	5
Unions, ¼- to 2-in.	267	Expansion joints, 3- and 4-in.	7
Plugs, ¼- to 4-in.	170	Composition bibbs	12
Tees, ¼- to 4-in.	114	45° ells	9
Tees, 8-in. galvanized	38		
Angle cocks, ⅜-in.	6		
Waste cocks	20		
Bushings, ¼x⅜ to ¾x1 in.	238		

Tools

Claw hammers	5	Steel figures, sets	1
4-lb. hammers	27	18-in. hammer handles	256
8-lb. hammers	6	36-in. hammer handles	67
Machine hammers	2	Drifting pick handles	207
Sledges, 10- and 12-lb.	2	Track-jack handle	1
Scoop shovels	14	Peavy handles	2
L. H. R. P. shovels	724	File handle	1
Hand saws	21	Ax handles	12
Pick eyes	24	Hacksaw blades	221
Rake	1	Hacksaw frames	2
Axes, handled	80	Peavies	2
Files	183	50-ft. tapes	3
Trimo wrenches	15	Lanterns	8
Monkey wrenches	15	Lantern globes	1
Trimo wrench frames	6	Ore buckets	8
Baxter wrenches	3	5-gal. buckets	37
"Always ready" wrenches	3	Oilers	16
Brooms	30	Emery wheels	8
Trimming shears, pair	1	Miner's hand lamps	45
Jacks	2	Nut augers	2
Calipers, pair	2	Plug taps	12
Dividers	1	Tinners' shears, pair	1
Thickness, gage	1	Pliers, pairs	3
Flue cleaner	1	Wheelbarrows	4
Mops	2	Saw-tooth holders	12
Wash tubs	6	Saw teeth	156
Carpenter's chalk, gross	½	Rubber brushes	3
Keyseat clamps, pair	1	No. 1 Milburn light	1
Rubber hand pumps	3	Pocket scriber	1
Chain block, 1-ton	1	Machinists' plumb level	1
Calcimining brushes	5	File guards	3
Breast drill	1	Emery-wheel dresser	1
Screw plate	1	⅞ drill bit	1
Expansion bits	2	Pipe cutters	6
Combination reversible ratchet	1	Drill bits	6
Machinist's hand taps, sets	9	Twist drills	30
		Wood augers	2

MIAMI COPPER CO.

Mine Supplies Jan. 1 to July 1, 1913, Underground Mining; 489,627 Tons of Ore and 32,668 Tons of Waste Mined

Fuels

Coal:		Coke:	
3-in. lump, tons	537	Furnace, tons	136
Blacksmith, tons	65	Oil:	
		Fuel oil, bbl.	52,748

3200 b.hp. used.

Lumber

Mine timbers, ft.	3,347,712	Mine stulls, pc.	11,780
Mine lagging, ft.	1,268,739	Mine wedges, pc.	154,340
Building lumber, ft.	161,916		

Explosives

Dynamite:		Powder:	
1⅛-in. 30% gelatin, lb.	31,750	Judson powder, lb.	50
1⅛-in. 40% gelatin, lb.	2,150,550	Fuse:	
1⅛-in. 70% gelatin, lb.	50	Comet fuse, ft.	715,100
		Caps:	
		Electric exploders	500
		6X caps	123,400

Oils, Grease, Etc.

Oils:		Oils:	
Kellogg a.c. cylinder oil, gal.	5374	Fish oil (for paints), gal.	53
Cap. cylinder oil, gal.	3647	Linseed oil (for paints), gal.	913
Renown engine oil, gal.	2710	Turpentine (for paints), gal.	206
No. 1, heavy concentrator oil, gal.	3888	Wood alcohol (for for paints), gal.	46
Ario compressor oil, gal.	3545	Grease:	
Dark summer oil, gal.	1457	Arctic cup grease, lb.	17,004
Gasoline, gal.	2223	Mica axle grease, lb.	2,460
Kerosene	1024	Candles:	
		Candles, cases	1,326

Iron and Steel

Bar iron and steel, lb.	100,293	Castings, lb.	164,350
Steel plates, lb.	77,713	Drill steel, lb.	30,318

Pipe and Fittings

½-in. up to and including 1-in. pipe, ft.	34,907	Above 2-in. and including 4-in. pipe, ft.	1,304
Above 1-in. and including 2-in. pipe, ft.	27,100	14-in. welded steel pipe	54
		6¼-in. casing for drill holes, ft.	209

Pipe fittings cost $1910 or 18.5% of total pipe cost.

Tools

No. 6 picks	702	Mill brooms	175
Pick handles No. 34	1543	10-in. bits	2
Shovels	1078	Stucco brushes	97
Axes	73	Grindstone	1
Ax handles	222	No. 4 trucks	3
Cant-saw files	396	Machinists' vises	2
Hacksaw blades	3047	Chain hoist, ½ ton	1
Drill-hammer handles, etc.	587	Car movers	4
Pipe wrenches, 14-in.	210	Rail benders	3
Saw, crosscut and hand	49	Stock for Toledo pipe dies	1
Wheelbarrows	171	Wall brushes	6
Little Giant electric drills	3	Rivet buster	1
		1-ton Peerless hoist	1

NEW JERSEY ZINC CO.

Mine Supplies used in Six Months. Ore Broken, 216,650 Tons; Waste Broken, 97,770 Tons; Total Tons Broken, 359,420 Tons

Fuels and Power (Not All Used for Mining)

Tons coal	10,177	Average hp. 6 months	7532.98

Lumber

Mine timber, ft.	138,864	Spruce, chestnut, pine, ft.	819
Mine lagging, 4-in., ft.	262,811		
Mine plank, ft.	49,810		

Explosives

Gelatin powder, lb.	145,250	Delay act. fuses, ft.	7,200
Caps	207,610	Fuse, ft.	586,450
Victor fuses, ft.	39,328	Fuse cutter	1

Consumption of powder about 0.556 lb. per ton of ore; of fuel, about 3.16 ft. per lb. of powder.

Oils, Greases, Etc.

Alcohol, pt.	1	Black oil, gal.	195
Gasoline, gal.	6	Kearsage oil, gal.	107
Turpentine, pt.	1	Hydraulic oil, gal.	7
Grease, lb.	769	Kerosene, gal.	114

Consumption of lubricating oils about 1 gal. for 850 tons ore; of lubricating greases, about 1 lb. for 342 tons of ore.

Iron and Steel

Channel iron, lb.	317	Stub steel, lb.	10
Round iron, lb.	5501	Round soft steel, lb.	1498
Angle iron, lb.	8465	Square soft steel, lb.	103
Flat iron, lb.	5911	Nickel steel, lb.	1535
Tool steel, lb.	245	Sheet steel, lb.	73
Flat steel, lb.	300	Spring steel, lb.	42
Shafting, lb.	183	Bar steel, lb.	304
Drill steel, lb.	24,977		

Consumption of iron and steel about 1 lb. for 5.4 tons of ore.

Pipe and Fittings

½- to ¾-in. pipe, inclusive, ft.	290	4-in. couplings, pr.	2
1-in. pipe, ft.	1249	2-in. flanges, pr.	40
3- and 5-in. pipes, ft.	34	4- and 5-in. flanges, pr.	8
Crosses	1	Unions	57
Reducers	9	Bushings less than 2-in.	621
Valves	4	Tees less than 2-in.	78
Ells less than 2 in.	99	Cocks	52
Plugs less than 2-in.	320		
2- and 4-in. couplings, pr.	16		

Tools

Adzes	4	Steel-wire brushes	4
Axes	24	Tar brush	1
Crosscut saws	7	Paint brushes	5
Draw knife	1	Crayons	18
Carpenter's square	4	Chalk line	1
Wood bits	5	Chalks	12
12-lb. sledges	9	Sledge-hammer handles	275
6-lb. hammers	5	Adze handles	4
Picks	44	Shovel handles	6
Shovels	101	Pick handles	255
Universal ratchet	1	Hammer handles	154
Rules	2	Machine-hammer handles	10
Screwdrivers	5	Ax handles	55
Wrenches	89	Saw handles, pairs	6
Stilson-wrench frames	3	Pipe taps	3
50-ft. tapes	3	¼-in. taps, set	1
24-in. level	1	Thread thimbles	32
T-shank drills	45	Files	95
Angle divider	1	Grindstones	2
Hacksaw frame	1	Water pails	4
Emery wheel	1	Wrench nuts	3
Timber cranes	24	Wrench jaws	5
Hacksaw blades	569		
Cutter wheels	3		
Brooms	3		

HOLLINGER GOLD MINES

Supplies for One Year (Part Used in Construction); 140,131 Tons of Ore and 11,544 Tons of Waste Mined

Fuels and Power

Coal:		Wood:	
Steam coal, etc., tons	2252	Wood for fuel, cords	3136
Blacksmith coal, tons	109	Oil:	
		Fuel oil, bbl.	571
Coke:		Electric current, hp. year	1313
Hard Coke, tons	93		

Lumber

Rough lumber, ft.	298,124	Shiplap, ft.	63,966
Dressed lumber, ft.	242,873	Mine timber wedges, pc.	13,500
Square timber, ft.	99,893		
Lagging, ft.	31,835	Base mold, board, window stop, etc., ft.	10,632
Flooring, ft.	53,025		

Explosives

Dynamite:		Lead wire, ft.	9,000
7830 cases, lb.	391,500	Connecting wire, lb	140
Fuse, etc.:		Detonators, boxes	1047
Fuse, ft.	1,128,000	Cap and fuse crimpers	27
Electric and time fuses, boxes	91	Electric blasting batteries	5

Consumption of dynamite about 3.8 lb. per ton of ore.

Oils, Greases, Etc.

Oils, lubricating:		Oils, miscellaneous:	
Dynamo oil, bbl.	13	Wood alcohol, gal.	10
Compressor oil, bbl.	18	Turpentine, gal.	27
Cylinder oil, bbl.	28	Greases:	
Crusher oil, bbl.	7	Arctic cup grease, lb.	3450
Transit oil, bbl.	1	Special gear grease, lb.	890
Oils, miscellaneous:		Mica axle grease	1184
Gasoline, bbl.	11	Galypsol grease, lb.	1233
Kerosene, bbl.	33	Camshaft grease, lb.	678
Polarine oil, bbl.	2	Flake graphite, lb.	310
Linseed oil, bbl.	4	Cable dressing, lb.	667
Mineral seal oil, drums	3	Belt dressing, lb.	113
Floor oil, bbl.	½	Candles, cases	1130
Electrolite, bbl.	⅛		

Consumption of lubricating greases about 1 lb. for 18 tons of ore.

Iron and Steel

Bar iron and steel, lb.	72,124	Cold-rolled shafting, 1 in. to 3⅛ in., lengths	89
Sheet steel, lb.	23,215		
Drill steel, lb.	67,755		

Consumption of iron and steel, not including shafting, about 1 lb. for 0.86 tons of ore.

Pipe and Fittings

Pipe:		Unions, ¼ to 8-in.	8,010
Black iron, ¼-in. to 8-in., ft.	36,371	Plugs, ¼- to 8-in.	2,125
Spiral riveted, 6-in., ft.	750	Caps, ½- to 4-in.	847
Valves:		Couplings, ½- to 3-in	1,314
Brass globe, ¼- to 2¼-in.	512	Bushings, ⅜- to 8-in.	11,118
Angle valves, ½- to 1-in.	145	Reducing couplings, ½- to 6-in.	1,489
All iron gate, 1- to 8-in.	113	Crosses, ½- to 2-in.	504
Sundry valves	199	Tees, ⅛- to 8-in.	2,413
Nipples, ⅛- to 8-in.	23,592	Reducing tees	43
Elbows, ⅛- to 8-in.	11,761	Return Y's, 2- and 3-in	162
Street elbows, ½- to 1-in.	860	Return bends, 1- to 2-in.	214
45° elbows, ½- to 3-in	815	Brass and iron stop cocks	2,084
		Valve seats, ½- to 2-in.	214

Tools

Sledge hammers	34	Chain blocks, 1- and 10-ton	2
16-lb. rock hammers	32	Pulley blocks	8
Striking hammers	42	Crayons, gross	4
Claw hammers	180	Files	1644
Machinists' hammers	132	Hacksaw blades	1920
Riveting hammers	3	Hacksaw frames	16
Axes	384	Hand saws	48
Fireman's axes	4	Crosscut saws	2304
Shovels	759	Twist drills	185
Spades	44	Ship augers	28
Coal scoops	14	Braces	3
Hammer handles	1272	Bits	19
Pick handles	524	Taps and threads	45
Ax handles	276	Sets stocks and dies	2
Peavie handles	36	Pliers	9
File handles	180	Screwdrivers	42
Awl hafts	43	Garden rakes	12
Stilson wrenches, 6- to 48-in.	631	Plasterers' hoes	6
Stilson-wrench nuts	168	Mason's lines	216
Stilson-wrench jaws	124	Soapstone crayons	864
Stilson-wrench frames	87	Collets and dies	19
Monkey wrenches, 8- to 15-in.	474	Vises	8
Drift picks	492	Tube expanders	5
Rock picks	168	Eberhardt turning tools	7
Chain tongs	7	Cutters for keyseater, set	1
Armstrong boring tool	1	Cutters for emery-wheel dressers, sets	6
Farrier's knives	3	Trimo cutters	2
Racks for bolt threader	2	Paint brushes	84
Chisels	4	Corn and stable brooms	480
Steel brooms	168	Tinsmith snips	4
Galvanized-iron pails	41	Emery wheels	2
Flue cleaners	6		
Cant hooks	48		
Tackle blocks	58		

(To be continued)

Recent Dividend Actions

The New York *Evening Post* sums up recent actions of mining companies listed on the Exchange as follows:

Butte & Superior, unchanged at 75c.; Utah Copper unchanged at 75c.; Guggenheim Exploration, unchanged at 87½c.; Chino Copper, reduced from 75c. to 50c.; Anaconda, reduced from 75c. to 25c.; Ray Consolidated and Nevada Consolidated dividend action deferred. These dividend actions were for the current quarter.

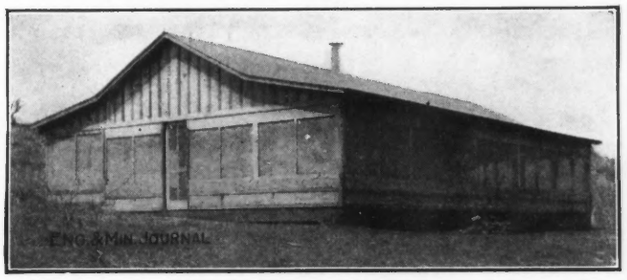
Details of Practical Mining

Open Screened Dormitory in Southwest

By A. L. Flagg*

The dormitory shown in the accompanying photograph was recently built by the Kelvin-Sultana Copper Co., at Kelvin, Ariz., for the accommodation of its miners. The building is inexpensive, comfortable and sanitary, well adapted to use in localities where the climate is exceedingly warm in summer and the winters not cold. The normal capacity is 24 men, though, with crowding, it will accommodate nearly twice that number. During the warmest days, interior temperatures were from 4° to 11° lower than out of doors in the shade, depending on the direction of the wind.

The dormitory proper, 14x26x8 ft., is a galvanized stamped-steel building, in sections, of the "Pruden System" all-metal, portable type. Around this, on all four sides, a porch 8 ft. wide was built. This is boarded up to a height of 3 ft. Above the boards and extending to within a foot of the eaves is a screened opening 40 in. wide, covered with ordinary galvanized screen cloth. A continuous roof covers both the steel structure and the screen porch, an air space of 2 ft. being left over the roof of the steel building. The inner building is provided with four windows on the sides and a door at one end. At the front end and in one corner is a lavatory with running water and a drain. The building is lighted by electricity. Twelve double steel bunks with good springs and mattresses are provided.



Kelvin-Sultana Dormitory with Screened Porch

[We incline to the opinion that the miners inhabiting this outdoor sleeping porch are in luck.—Editor.]

Determination of Dip of Beds from Drill Cores

In E. E. White's article, published in the Journal of Sept. 19, there occurred the statement, "Consider r as equal to unity." As a matter of fact, the distance from the point a on the drill hole to the intersection of the drill hole with the bedding is considered as unity in deriving the formulas. Mr. White's manuscript was correct, the error having been made in editing.

*Mining engineer, Kelvin, Ariz.

Unusual Problem in Openpit Mining*

The ore deposit at the Virginia mine varies in chemical composition almost beyond belief, comprising almost every oxide, hydroxide and carbonate of iron. Some of the ore is magnetic—in fact, the best of it is. In part of it there is a large percentage of carbonate; in some of it a great deal of pyrite; there is some oxide of manganese—these in addition to every form of hematite. The variation occurs both vertically and horizontally. For example, a 65-ft. vertical bank in the pit has 16 layers, each a different kind of ore. The adjacent layers vary widely in composition; thus a 4-ft. streak running 59% iron, 0.045% phosphorus and 0.070% manganese is followed by a 5-ft. layer running 50% iron, 0.136% phosphorus and 3.35% manganese. The range of the iron in the bank is from 63 to 43%; of the phosphorus, from 0.02 to 0.25%, and of the manganese, from 0.30 to 5.20%. The variation horizontally is equally great; thus frequently bank samples on 10-ft. banks run 59% of iron and 0.03% phosphorus, while the cars loaded from these banks run any other analysis that the wildest imagination can invent. Imagine the disappointment when a bank like the above gives in the car sample 48% iron, 0.136% phosphorus and 3.25% manganese.

In appearance there is nothing to indicate the kind of ore present. There are soft ores and hard ores, sandy ores, steel ores, and ores blue, red, black, yellow or gray. Visitors to the pit used to wonder why we were loading a gray-looking rock, refusing to believe that it was ore until they had an analysis of a sample taken personally. A representative of the fee owners ordered thrown out of a car a lot of stuff which he thought was rock, which upon analysis proved to carry 66% iron and 0.044% phosphorus, the highest grade of ore ever found in the pit.

So when orders came at the opening of the season of 1911 to ship but one grade and that a high-grade bessemer, there had to be found ways and means to do it. The guarantee was 57% iron, 0.36% phosphorus and 0.76% manganese—you can imagine the prospects as to an output.

A laboratory was built at the mouth of the pit and a high-speed chemist and two swift and accurate samplers put to work. Four dumps were started, one for high-phosphorus ore, one for low-iron, one for high-manganese, and one for waste. Two steam shovels were kept under steam constantly and handled by one crew alternately as the nature of the ore required; this frequently meant several changes a day from one shovel to the other.

The ore was sampled in one-car lots and analyzed for iron, phosphorus and manganese separately. From these one-car samples, five-car samples of grade ore were built up. The sampling was done in the pit. The chemist's

*An abstract of an article by John H. Eby, superintendent of the Virginia mine, Virginia, Minn., appearing in the Michigan College of Mines "Alumnus," April, 1914.

return on one element was out in 35 minutes after the ore was loaded. If a car was too high in phosphorus or manganese or too low in iron to be combined with what was expected from the other shovel, it was sent to one of the dumps. The analyses determined in which dump it belonged; they also determined how soon ore that could be used would be reached. Frequently the cars had to be held for the chemist's complete returns before they could be dumped. Low-iron and high-manganese were not wanted on the non-bessemer dump, nor high-iron on the low-grade dump, and above every thing else, not one pound of ore was to be wasted that could be used in a mixture to produce guarantee ore.

In addition to these difficulties, the ore was generally hard and broke in large pieces. These pieces had to be broken with hammers to a maximum size of 6 in.; 16% of the total working time was spent at this work, the shovels having to wait while the men broke the ore. Frequently not over 50 tons per hour was loaded.

In making up the grades of the samples a system of records and orders was established. The first record was the analysis sheet kept by the chemist, Table I, containing analyses of the separate cars. From this sheet the superintendent would, whenever possible, build up a five-car lot and issue an order, Table II, to the chemist,

TABLE I—ANALYSIS SHEET

Sheet No. 35

Car No.	Iron	Phos.	Mang.	5-Car Sam. No.
9,654	59.37	0.056	0.50	757
10,237	50.21	0.020	3.21	758
8,464	49.36	0.018	1.75	757
10,786	57.32	0.055	0.60	756
11,114	63.10	0.055	0.75	758
10,176	55.14	0.020	0.50	757
6,742	63.10	0.042	0.20	756
8,513	51.20	0.015	1.10	756
9,120	54.15	0.018	1.30	758
11,013	58.25	0.045	0.43	756
5,437	56.12	0.026	0.70	758

TABLE II—CHEMIST'S ORDER

June 25, 1911.

Virginia Mining Co.,
Virginia Mine.

Chemist please make up and run the following sample No. 756:

Car No.	Iron	Phos.	Mang.
6,742	63.10	0.042	0.20
10,786	57.32	0.055	0.60
11,013	58.25	0.045	0.43
8,513	51.20	0.015	1.10
3,762	52.11	0.017	1.20
	281.98	0.174	3.53
	56.40	0.035	0.70

.....
Supt.

to make up the five-car sample for it. The number of this five-car sample was placed opposite the car numbers on the analysis sheet. Three copies of this order were made; one went to the chemist, one to the analysis clerk and one was filed on record. Another order, Table III, was made up instructing the yardmaster and shipping clerk to have the five cars switched out and shipped.

TABLE III—YARDMASTER'S ORDER

June 25, 1911.

Virginia Mining Co.,
Virginia Mine.

Yardmaster make up and shipping clerk bill out samples Nos.:

756	757	758
6,742	9,654	10,237
10,786	8,464	11,114
8,513	10,176	9,120
3,762	10,345	5,437
11,013	7,538	6,378

.....
Supt.

Frequently three or four days would pass during which no grade samples could be built up and the ore had to be carried until some different ore was loaded. At such times as many as 90 cars would accumulate in the yard; and then the shovel would get into the right kind of ore and there would be a cleanup and in 24 hr. there would not be a loaded car in the yard. The switching out of the samples was difficult, for the cars had to be picked out from all over the yard. This took 25% of the working time of the engine crews.

There was no system of mining; it was dig where you could get the ore and dodge what you could not use; and there was always the chance of getting completely tied up. Many a time nothing but vigorous and drastic measures systematically carried out saved the closing down of the mine. On two different occasions cargoes were within 800 tons of finished, yet it was not possible to finish the cargo until 5000 tons of ore were sent to the dumps and four days spent in getting the small amount required. The records for the season of 1911 show that to obtain the 97,000 tons of grade bessemer ore, 60,000 tons of off-grade and waste had to be moved. The handling of this occupied 28% of the total working time of the shovels. The changes of shovels were frequent, and a great deal of track-shifting was required.

I think that this record challenges comparison for production of a high-grade ore out of a low-grade deposit; for the average of the 60,000 tons off-grade did not exceed 52% iron.

Diamond-Drilling through Steel

By Wallace G. Imhoff*

In the Iron River district, Michigan, there is a heavy overburden of sand and gravel. On a certain job churn drilling had been conducted for a week or so; the surface was extremely hard to get through and blasting was necessary in a number of cases. At a depth of 146 ft., ledge was reported encountered and accordingly the diamond drill was connected up. From the start extremely hard drilling was reported with little or no progress; the diamond setter was sent for and given charge of the drilling.

Casing Core Taken by Diamond Drill

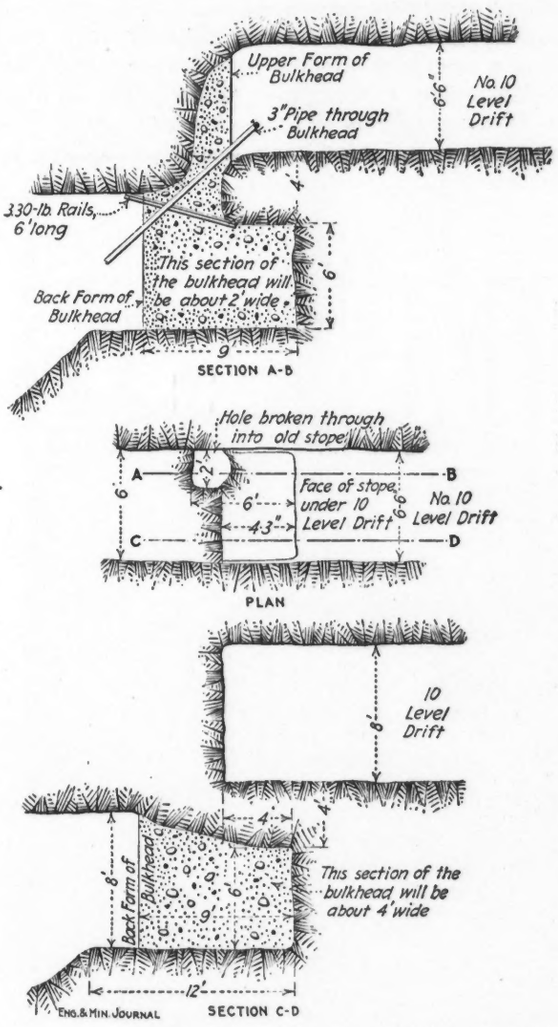
For six hours diamond drilling continued with but slight progress. At length the drill rods suddenly sank, drilling became easy and sand and gravel issued from the wash water. The drill was immediately stopped and the rods drawn. Upon examining for core the piece of steel pipe, shown in the illustration, was found. The diamonds had cut a section through the 3-in. casing. Only those familiar with diamond drilling can fully appreciate the skill of the setter who accomplished this feat with no broken diamonds or even the loss of 1/64 carat.

*Consulting engineer, Pittsburgh, Penn.

The trouble was caused by blasting without pulling the casing high enough; when the blast exploded it tore and feathered the easing, closing up the end of the pipe in such a manner as to give those in charge of the drilling the impression that rock ledge had been encountered.

Concrete Bulkhead of Irregular Shape*

The accompanying drawing represents a concrete bulkhead of irregular shape installed to resist a water pressnre of 50 lb. per sq.in. between the old and new workings of the Hibernia magnetite mine, in New Jersey.



THE CONCRETE PLUG AT THE 10TH LEVEL

After thoroughly cleaning and washing the mushroom-shaped cavity, the forms were placed, and braced from behind with 6-in. and 8-in. round timbers. The inside of the forms was covered with tar paper, and a 3-in. drain pipe, for possible future use, was run through the forms. This pipe was fitted with a gate valve on the working side. Two-thirds of a cubic yard comprised a batch of concrete, which was mixed rather wet, so that after a batch had been placed, water rose slightly above the level mass. Three iron rails were placed across the mouth of the cavity for reinforcement. The 12 yd. of concrete was placed in 10½ hr. The accompanying table give the costs.

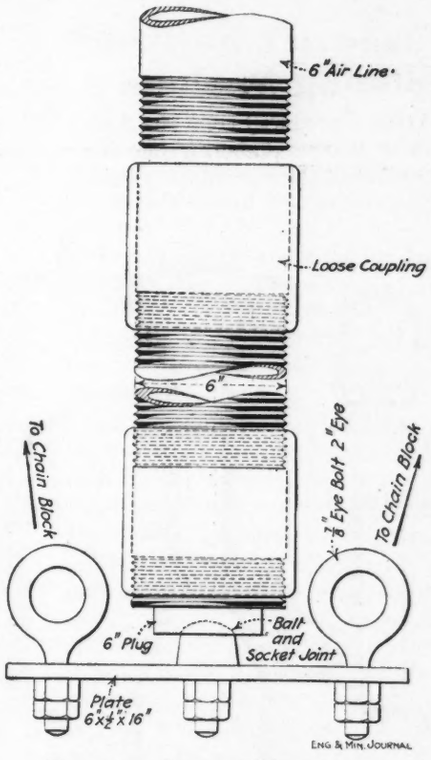
TOTAL AND UNIT COSTS

	Total	Per Cu. Yd.
Labor	$134.00	$11.15
Superintendence	30.00	2.50
Transportation	4.50	0.37
Materials	37.23	3.10
Total	$205.73	$17.12

*From the A. I. M. E. "Bulletin," August, 1914.

Air-Pipe Connection in Sinking*

In sinking the Palms shaft of the Newport Mining Co., a 6-in. pipe line was used for the compressed air. The accompanying illustration shows the bottom connection. The method of adding a new section was as follows: To the top end of the new section at the surface a coupling was fastened closely by a few threads, and at the bottom end there was attached a temporary coupling with the socket of a ball-and-socket joint. The pipe was lowered underneath the bucket with a ½-in. chain, a clamp keeping it from slipping. The plate of the ball-and-socket joint was supported underneath the air line by two chain blocks. The lower end of the section of pipe was swung over upon the plate by hand. Then the section was raised by the chain blocks up to the end of the air line, and a few quick turns of the loose coupling made the connection. The coupling was then tightened with chain tongs.



BALL-AND-SOCKET SUPPORT FOR NEW SECTION OF PIPE

Blasting-Machine Rheostat Tester

The September *du Pont Magazine* strongly advises the use of the rheostat for testing a blasting machine before use. By introducing as many units of resistance into the circuit as there will be detonators in the blast and firing one detonator for a test, the blaster is assured that the machine will fire the whole blast and will fire it for him. The latter point is important as there is a certain knack in getting the utmost out of a blasting machine. and an expert operator can often fire more holes than another perhaps stronger man. Furthermore, this testing

*An excerpt from an article presented before the Ishpeming meeting of the Lake Superior Mining Institute, Aug. 31, 1914.

builds up the machine and restores any residual magnetism lost by disuse or by jolting.

The six-post rheostat is so designed that all resistances from 0 to 100 units can be had in steps of five. The unit is equal to the resistance of one detonator.

While this rheostat tester is simple and substantial, without moving parts, it is necessary to follow directions and use sense in making connections. Instances are known where connections were so made that no resistance was introduced and a defective machine was indicated to be in shape.

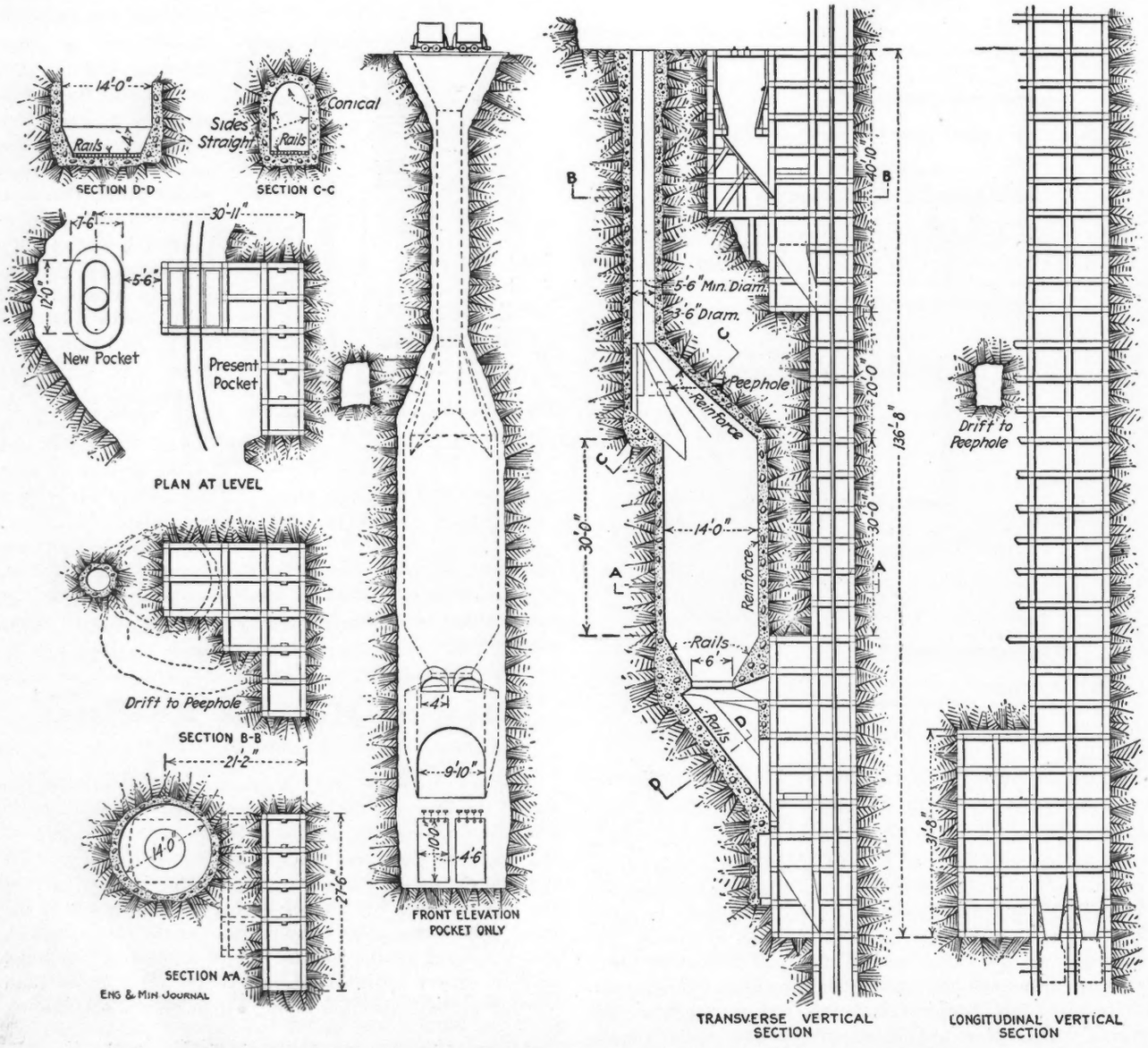
In testing, precautions must be taken to avoid being hit with flying pieces of copper. The cap should be buried in sand 6 to 8 in., or put behind a good healthy rock or tree.

Concrete Hoisting Pockets

The accompanying drawings reproduced from the August, 1914, *Bulletin* of the A. I. M. E. represent a concrete-lined storage and loading pocket of the Sacramento shaft, the principal hoisting shaft of the Copper Queen company. It is believed that the elimination of upkeep cost on the concrete lining will more than compensate for its increased first cost over a wood lining. Furthermore, the shape of the pocket and the smooth surface make the lining particularly adaptable for handling the wet sticky aluminous ores, for which purpose it was installed.

The pocket starts with an elliptical bell-mouth and tapers to a 3½-ft. cylindrical chimney. This enlarges to a circular pocket 14 ft. in diameter and about 30 ft. high. The capacity of this, the pocket proper, is 52,000 cu.ft. or 260 tons. It has a conical bottom with a 6-ft. opening which feeds to a small pocket, which in turn supplies the mea. uring pocket.

From one of the shaft compartments a drift runs around to a peep-hole into the pocket where the cylindrical chute widens to the pocket proper. The slanting bottoms at various points in the pocket are covered with rails where they are subject to the impact of falling ore The concrete lining is reinforced in some places.

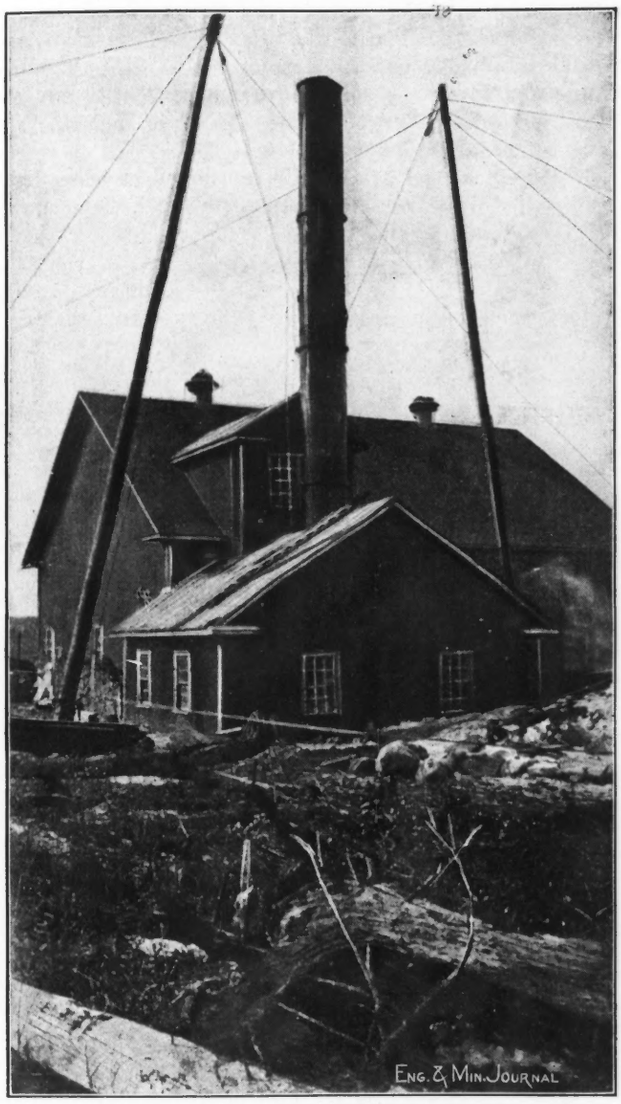


SECTIONS OF NEW CONCRETE-LINED SKIP POCKET AND OLD TIMBERED POCKET

Details of Milling and Smelting

Rig for Lifting Stack

The accompanying illustration shows the rigging that was used to lift a sheet-metal stack from the ground and drop it into a hole in the roof of a boiler house. The stack was in one piece and lay on the ground by



RIG FOR LIFTING STACK AT BALKAN MINE, ALPHA, MICH.

the side of the boiler house, which was completed, except for erecting the stack, a hole having been left in the roof for the latter. The guy pole, at the left in the picture, was tipped a little back from the vertical, and a rope from it was attached to the stack, which lay on the ground beneath the pole. With this pole, the stack was then raised sufficiently to clear the roof, and the guy lines from this pole were then pulled over to swing the pole around until the stack was over the roof. A line from the guy pole at the right of the picture was then attached to the stack, to which was also fastened a fag line. The stack was then raised to a vertical position, shifted over the hole and dropped into the latter. In this way the possibility of damaging the roof was avoided.

Smelting Furnace for Cyanide Precipitate*

BY P. S. ANDERSON†

The following notes are submitted in the belief that they may interest operators of small cyanide plants, where the installation of an expensive tilting furnace is not practical.

The furnace I am about to describe is well adapted to the Taverner lead-smelting process which I have used for years with good results. My last furnace was used for nearly four years and was built in a 24x42-in. carbody. Brickwork had to be replaced about every 12 months.

To provide for the tilting feature, I placed two 12x12-in. timbers, 4 ft. long, parallel with and ½ in. away from each side of carbody, then across these timbers, and 2 in. from back end of carbody, I placed a piece of 16-lb. T-rail 48 in. long, for back end of furnace to rest on.

Then by running a piece of ⅞-in. drill steel through lugs on the bottom of the carbody, I had the tilting feature. For the furnace proper, I placed two solid tiers of firebrick in the bottom, then one tier around, so as to leave inside dimensions 14x27 in., building flush with front end of the carbody. This made room for cupel or test, which was made concave and slightly lower at back end, thus allowing closer tapping of slag before the final pour. The next tier of brick was left with an opening 2¼x4½ in. (space of ½ brick) in the center of front end. This made the tap hole, which was filled up before starting the furnace with a mixture of fireclay and sand. Two more tiers of brick brought the furnace up to the burner opening at front end.

The burner opening was made so as to throw flame on the charge at angle of 45°. Over the furnace, for 18 in. from front end, I placed a low arch of firebrick. For the charging door, which also made balance of furnace top, three firebricks, held together with an iron band, were used, having a hook to which a chain was attached and run over a pulley, for lowering and raising door.

At the back end the last or top tier had an opening 2¼x4½ in., into the dust chamber, made by bricking in the rest of the length of the carbody and covering it over, leaving an opening on top to let the gases escape into the hood. Tilting was done with a lever attached to the dumping handle of the car. After filling around with sand and drawing the sides together with a rod passed through the door lugs (door being removed), the furnace was ready.

*A paper read before the Columbia Section, A. I. M. E.
†Baker, Ore.

A Case 2½-in. burner was used. When I wished to smelt, the cupel was tamped in, and a slow wood fire started in the evening, which was allowed to cool down by morning. The furnace was charged with about 100 lb. of precipitate, litharge and flux, about 70 lb. of damp precipitate being used, and the furnace was started. As this melted down, more was added with a scoop shovel until there was about 7 in. of molten material in furnace. After stirring, and when the slag was fluid, the first tapping of slag was taken off if necessary, otherwise scrap material was fed in, such as old cupels, speiss, etc., and the fusion completed.

In tapping, about two-thirds of the slag was taken off into a mold, and the balance of the charge heated until the cupel, on testing with rod, felt smooth, when all the remaining charge was poured into another mold by tilting the furnace. After cooling, slag and speiss were removed and the lead bar placed in the furnace for cupellation. To start, charcoal was placed on the lead bar and the burner turned on. After it opens, fireclay is removed from the front opening of the furnace and temperature is regulated with the burner. After the bar solidifies, it is removed and cut up, resmelting in two No. 8 graphite crucibles.

Although the lead was allowed to go to waste, I found it paid on account of getting cleaner slag and bullion. Very little gold was found in the flue dust, although there was considerable silver. Samples gave average results of 12.10 oz. gold and 1140 oz. silver per ton. The slags averaged 2c. per lb., gold and silver, or $40 per ton. Gasoline consumption averaged, including cupellation and resmelting, 1 gal. per 18 lb. of precipitate.

Composition of Lead Slags

The chemical composition of the slags produced in lead smelting has always had important consideration. In recent years, however, the views of metallurgists have been considerably modified, says Irving A. Palmer.[1] Experience has shown that many of the irregularities in the furnace work, formerly thought to be due to the composition of the slag, are the result of other causes. Laboratory experiments throw some light upon the constitution of lead slag. It is now known that these slags, instead of being definite chemical compounds, are in reality mixtures of a number of compounds and oxides; these probably exist in a different state of combination while in a molten condition than when solidified. These compounds can exist in a great variety of proportions without materially changing the fusibility or fluidity of the slag. It is recognized also that certain oxides, such as those of aluminum and zinc, may not be combined with silica at all, but may be an igneous solution in the slag.

With larger furnaces and the improved methods of preparing the charge now in use, hotter slags are produced than formerly. This has led to the employment of slags heretofore considered to be too refractory for lead-furnace work. The slags still conform generally to the singulo-silicate type, but often there is a considerable portion of bisilicate. In localities where there is a surplus of siliceous ores, the metallurgist will make a slag high in silica, so as to smelt more of the ore that is most abundant. So also he will generally use as much lime as possible, because it is a cheaper flux than iron. Of course, it is generally held also that high-lime slags are beneficial metallurgically. In this connection it may be said that high-lime slags are more in use than they were in times past. The old idea that the lime and iron oxides should exist in the slag in certain definite molecular proportions has been discarded by most metallurgists. This so called "type" theory was supported for a long time and was considered by some to be extremely essential. Theory and practice have combined, however, to indicate that the things to be considered in adding lime to a charge are the question of cost and the percentages of silica, alumina, zinc and magnesia present, rather than the ratio of the lime to the iron. Lead slags are now regularly made containing from 35 to 37% of silica, and from 24 to 26% of lime, including magnesium and barium oxides, figured as lime. In these slags the zinc and alumina are generally low.

High-silica slags are usually considered as being liable to contain a rather high percentage of lead. To some extent this is true, but such a slag runs well, chills slowly, and keeps the furnace in good condition. Furnace accretions are always basic; high-silica charges inhibit their formation and are conducive to long campaigns.

[1] "Smelting Lead Ores in the Blast Furnace," Bull., A. I. M. E., July, 1914.

The Use and Care of Crucibles

Most crucible users are careful to store their crucibles in a warm place, and to anneal carefully before using them, according to a recent bulletin of the Bureau of Mines ("Brass Furnace Practice in the United States") but are not careful enough as to the fit of the tongs. If possible, a grab type of tongs should be used, such as is shown in the illustration, intended for use with a mechanical hoist. The tongs are locked into the hoist, lowered into place, the tongs being spread, and gently seated. The hoist then is gently started and the crucible is held by its own weight.

GRAB CRUCIBLE TONGS

Foundries using this type, report that they can handle up to 650 lb. of metal this way, and the excessive pinching of crucibles is avoided with a much longer resultant life. A crucible grows slightly smaller with use, owing to oxidation and wear. One foundry that reports an exceptional crucible life has three sets of tongs, differing slightly in size, which are selected according to the age of the pot. An easy way to keep tongs of proper size is to have a cast-iron form the size of the crucible used. When the tongs get slightly out of shape, put them on this form and pound them back.

Thomas Johnston Grier

Thomas Johnston Grier, superintendent of the Homestake Mining Co., died at his winter home at Los Angeles, Calif., Sept. 22, of heart failure, his sudden demise coming as a surprise to his many friends. Several years ago, Mr. Grier suffered from a severe attack of acute indigestion and was constantly under the care of a physician. He went East about 18 months ago and consulted some leading physicians. Upon his return to Lead after this trip he was greatly improved and continued apparently in the best of health until his death, active to the last in the administration of the affairs of the company he served.

Thomas Johnston Grier was born in Pakenham, Ont., May 18, 1850. James Grier, his father, was a native of Ireland, and Eliza Patterson Grier, his mother, was born in Canada. He was the fourth of a family of 10 children. With his parents he lived at Iroquois, Ont.,

THOMAS JOHNSTON GRIER

where he graduated from high school and later learned telegraphy. At the age of 17, he entered a telegraph office in Montreal, and four years later, on reaching his majority, removed to Corinne, Utah. After two years there he spent four years in Salt Lake City, becoming chief operator. It was while in this position that he became acquainted with George Hearst, one of the original owners of the Homestake, who induced him to go to Lead to become book-keeper and telegrapher for the new company.

He arrived in Lead in 1878 and immediately entered the employ of the Homestake Mining Co., then but recently organized, and remained with the company until his death. At the time Mr. Grier went to the Homestake, Samuel McMaster was superintendent and Mr. Grier became his trusted lieutenant, taking full charge during the absences of Mr. McMaster in the later years of his life. He filled the position so creditably and acceptably that upon the death of Mr. McMaster in 1884, Mr. Grier was selected superintendent, and has held the position ever since, a period of 30 years.

His marked ability as an organizer and his earnest adherence to high business ideals enabled him to develop a mining institution known the world over as one of the greatest low-grade gold mines. Under his management, the company became a steady dividend payer, omitting its disbursements only on two occasions, the last of which was after the great fire in the mine. Besides the dividends, many millions of dollars from the earnings were spent in improvements, all made with a view of adding efficiency to the plants of the company. The capacity was increased until today the daily output of this company has reached nearly 4500 tons. Under his direction were built the water system which not only supplies the works but the city of Lead and several surrounding towns, with water; the hydro-electric plant at Spearfish; the Ellison hoist; the viaduct connecting the mills with the railway system of the company. The Star and Amicus mills, were also completed during his term of office. Besides this, a high degree of efficiency was maintained in all departments of the large enterprise. At his direction the present work of installing one of the larger hoists in the country and the building of a steam auxiliary power plant was commenced.

The Homestake company with 2500 employees and a payroll of $225,000 per month, was under the sole direction of Mr. Grier and policies outlined by him were carried out; the entire management being left to his sound judgment and business ability. In connection with his duties as superintendent and general manager of the mine, he was also president of the First National Bank of Lead, vice-president of the First National Bank of Deadwood, vice-president and director of the Wasp No. 2 Mining Co. and president of the Hearst Mercantile Co. He had been a member of the American Institute of Mining Engineers since 1892. He was also a member of several Masonic orders, and life member of the Benevolent and Protective Order of Elks of Lead. His membership in the Homestake Veterans' Association dates from the time of the organization of that society. He was a member of the Episcopal Church and a loyal friend to all other religious denominations. He knew personally nearly every man in the different departments. He was always looking to the welfare of his fellowmen and there was no grievance so small that he would not give audience to it. It is said of him that no man no matter of what station in life ever approached him and failed to receive a respectful hearing, sympathy and sound advice. At his direction, a bonus of 7% of their yearly earnings has been given to the employees of the company for the last two years, as a Christmas gift.

The Homestake company has always cared for the welfare of its employees. For over 35 years it has provided a completely equipped hospital, which for the past four years has been absolutely free to the operatives and those dependent upon them for support. An Aid Fund, administered by the company, supported by contributions from each employee of $1 and the company $1000 monthly,

pays siek, aecident and death benefits. The Hearst free library, maintained by Mrs. Hearst, one of the largest stoekholders, is now housed in Reereation Hall. Mrs. Hearst also supports a free kindergarten. Recreation Hall, just completed, adequate in size for present needs, elegantly furnished, superbly appointed, which affords a lounging and amusement place for employees when off duty and also includes a beautiful theater, was erected at a cost of $300,000. In all these things, Mr. Grier took an active part, initiating and guiding as circumstances have required. In it all, he proved himself a man of strong intellectuality, broad human sympathies, fine sensibilities and clearly defined principles.

He was married in 1886 to Mary Jane Palethrope, of Glasgow, Scotland. She survives him, with a daughter and three sons.

At the elose of the sessions of the Federal Commission on Industrial Relations, held at Deadwood in August, Professor Commons, the chairman, made the following statement, referring especially to Mr. Grier's testimony before the commission:

I would like, on this question of the underlying causes that you have brought out, I would like for my personal use, not as stating any idea of my colleagues, to state to you what seems to me to be our purpose and line of suggestions which, from my standpoint, would be of use in the work that we have to do. As I stated at the beginning, we are required by Congress to investigate the underlying causes of industrial unrest, and to make recommendations for legislation to Congress and, naturally, to the states. If we find unrest, what are its causes and what legislation we should recommend as a remedy.

Now, I might state what seems to me to be the summing up of this testimony, that is, the way it strikes me from my own point of view, not representing either the employer or the employee, but simply as a looker-on, you might say: You have here the most remarkable business organization that I have come across in the country. You have developed welfare features which are beyond anything that I know of, and they are given with a liberal hand.

You have a high scale of wages, reasonable hours—very fair hours. There has been evidently great progress made in taking care of the employees in the hospital service, and you have taken care of the cost of living, have kept it down below what employees in other communities have been forced to pay. You have practically been able by your great strength here as a huge corporation, dominating the whole community, to look out for the welfare of your employees, and to bring in an admirable class of citizens. It seems also that you are influential in politics, that you secure a good class of officials, and that you have secured the enforcement of law, the reduction of immorality. It seems also that you make an effort to build up the religious life of the community and that your policy is broad and liberal in all respects. I take it also, that this policy depends solely upon your personality. Such inquiries as I have made here, indicate that in all cases the stockholders leave all these matters to you personally, and that this broad policy has been carried out by you on your own initiative, and that you have felt that it was necessary, for the good of the community, the securing a fine class of labor here, which you have undoubtedly done, that you should hold the reins pretty tight on this community.

Adding that he had visited business men and talked with individuals in the camp, the ehairman stated that from all he eould see or hear the Homestake management had wielded its power with the utmost fairness, had encouraged the religious life and educational life of the community and asked suggestions from Mr. Grier as to recommendations to be made Congress as a basis for legislation, pointing out in the course of his remarks the fact that another man in Mr. Grier's place might not exercise his power with the same fairness, justice and generosity that have eharaeterized Mr. Grier's administration. Mr. Grier did not offer the suggestions asked but, responding to the ehairman's question as to whether he would reeommend that superintendents be prohibited from beeoming stockholders in the company they represent, said that he should and declared that the reason he had never owned any Homestake stock or Hearst Mercantile stoek was that he felt it placed him in a better and fairer light before employees and toward the property to have no personal interest in dividends.

This declaration accorded with his whole eourse of action as manager and with his habits of mind. While deeply interested in the property under his charge, he never sought for individnal profit from its management.

The Alaska Coal Bill Passed

WASHINGTON CORRESPONDENCE

The leasing bill for Alaska's coal lands was passed by the Senate in form somewhat changed from the bill passed by the House. The bill provides the government shall reserve 5120 acres of coal-bearing land in the Bering River field and 7580 acres in the Matanuska for government mining, product to be used on Government railroads, in the navy.

Other lands are to be leased for not more than 50 years in 40-acre blocks, maximum tract 2560 acres; royalty to be 2e. to 5e. per ton and rental 25c. per acre for first year, increasing to fixed charge of $1 after five years, rentals to be eredited against royalty. Leases for local needs are to be made in tracts of 10 aeres maximum without royalty or rental. Attempts at monopolization are to be punished by forfeiture and an 8-hr. day underground is preseribed as maximum.

Recent Developments on the Comstock

SPECIAL CORRESPONDENCE

The new diseovery recently reported in the Belcher has excited a good deal of interest. The water formerly stood in the Belcher mine a little below the 1400 level. Since the water has been lowered, the Sturges management has driven one erosscut on the 1500 level, and another on the 1600. In each case a width of 60 to 70 ft. of ore that will assay between $8 and $15 per ton has been exposed. Its average is probably nearer to the lower figure.

This ore is the so called white rock or "gold ore" of Gold Hill. Large quantities of it were milled at the close of the bonanza period, and after the lower levels in Gold Hill were flooded. The water eame up slowly, and did not reach the 1400 level until the pumps in the Combination shaft, in Virginia City, were shut down in 1886. During the time when the gold Hill mines were flooded in 1881, and the time when the water reached the 1400, the Sutro Tunnel level, a large quantity of this low-grade ore was taken out from the Yellow Jaeket, Crown Point and Belcher mines. The ore occurs in lenses, parallel with the old bonanza stopes and to the west of them, toward the foot wall.

No considerable quantity of the new ore in the Belcher has yet been blocked out. However, the manager is quoted as saying that he is now able to make expenses out of the production, and that as soon as a direct eonnection with one of the shafts is made, he will be able to increase largely the produetion and earn considerable profit. The ore is very soft, erushing almost to a powder,

and therefore mines and mills very easily. The gold rock in Gold Hill has a reputation of concentrating about 100:1. The pyrites crystals in the ore are so small and fine as to be scarcely visible to the naked eye. In $15 rock not more than 50c. will be in silver.

Nobody can say as yet how much ore is likely to be developed in the Belcher, or how much profit the company is likely to earn. Such things depend largely upon the management. The present management is economical, but its efficiency is now to be demonstrated. The prospect in the mine, now that they are below the water level, and below the ground which has been mined over and raked back and forth a dozen times, appears to be favorable for further development. Anyway, the new Belcher discovery is very promising and many a mine operator would like to have one that looks as good.

In regard to the Comstock in general, it is considerably upset along with the rest of the world. The fight between Whitman Symmes and the San Francisco brokers was finally adjusted out of court. Symmes himself was anxious to see the thing through, but there were all kinds of opinions, and when one man is fighting an entrenched organization, with its many ramifications, there are many things to be considered. Some of the stockholders and directors of the Mexican thought that the fight ought to be settled, as it appeared that that could be done, and get back to work again. This was finally done by Mexican paying the attorney's fees of everybody concerned.

The Mexican and Union companies began work at opening up another level, the 2650, without waiting for action by the pumping association, which was holding the water a little below the 2500 level. Just as it was getting started, the European war broke out and the stock exchange was closed, with the consequences that assessments were not collectible. Mexican and Union were able to continue work, and did so, but the other three North End companies did nothing. The pumping association, however, has been keeping the pumps running. Con. Virginia is doing a little work, but Ophir and Sierra Nevada are doing nothing. Union is crosscutting on the 2650 level, and Mexican is beginning to cut for the 2650 station, and soon will be dlriving a crosscut there.

Mineral Resources of Morocco

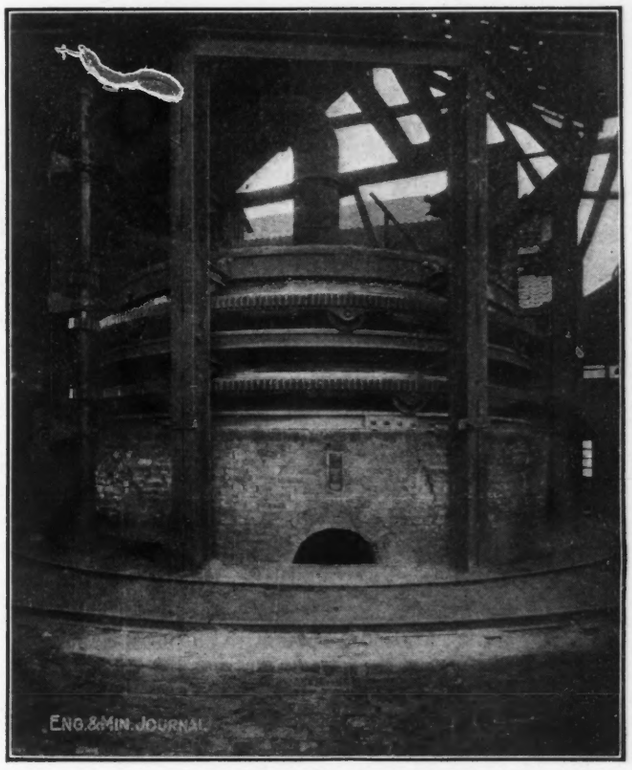
A report from the United States Consul-General at Tangier, says that the mineral resources of Morocco are as yet but imperfectly known. The country is believed to contain various valuable ores, such as copper, silver, gold and iron, especially in the Sus provinces, while there are widely distributed indications of the presence of oil in more accessible regions, all of which during the last few years have attracted attention commensurate with surface prospects. It will require, however, more than the superficial prospecting that has so far been undertaken to demonstrate whether the deposits are such as would justify exploitation.

As far as Moroccan mining interests are concerned, attention for the moment is centered in Paris, where an international arbitral commission is sitting with the object of adjudicating the various denouncements that have been filed at various times by those who carried out prospecting operations prior to the recent promulgation of the mining code for Morocco.

Furthermore, owing to the fact that the foreigner is still insecure in the particular regions alleged to contain the most promising deposits, and owing to the remoteness of these districts from the coast, and in view of a lack of all facilities of transportation, it is not anticipated that the mining interests in Morocco are likely to undergo any sudden or immediate development.

The Spirlet Roasting Furnace

A new mechanical roasting furnace that has attracted a good deal of attention among zinc smelters during the last year or two, is the Spirlet, which is exploited by the Erzröst Gesellschaft, of Cologne, Germany. The American agent for the furnace is Beer, Sondheimer & Co., 42 Broadway, New York. The general features of this furnace are shown in the accompanying engraving.



VIEW OF THE SPIRLET ROASTING FURNACE

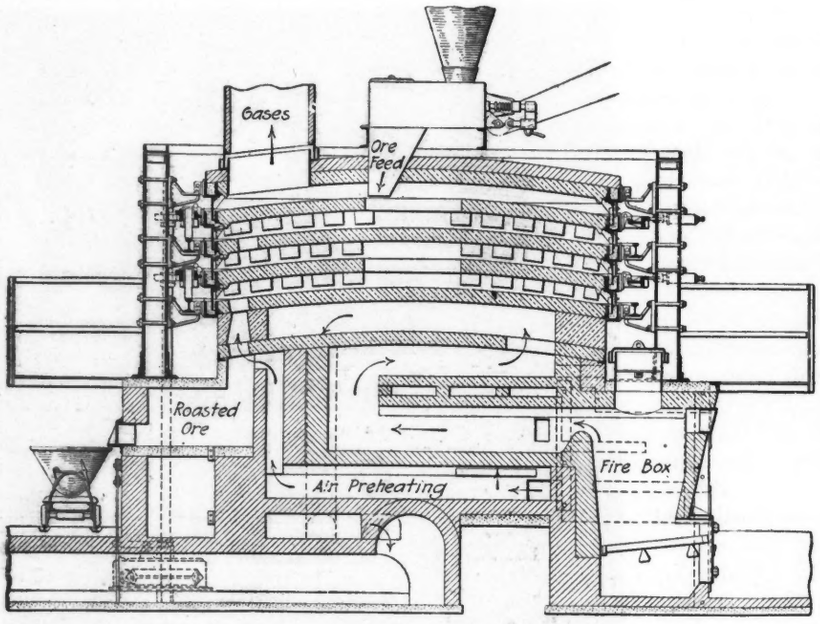
Note the method of supporting the revolving hearths, and at the left of the photograph note one of the vertical shafts for turning them.

The furnace consists of three circular hearths which revolve around a central axis, which is, however, purely geometric, there being no interior working parts in this furnace; a fourth and lowest hearth is stationary, as is also the roof of the furnace.

The furnace structure is built up within six vertical columns, to which are fastened annular rails for supporting the movable hearths. The movable hearths are constructed within an engirdling spur gear, shown clearly in one of the accompanying engravings, and the supported on wheels which run on annular rails, carried by the exterior framework. The spur gears mesh with small pinions attached to vertical shafts, which are connected with the source of power and constitute the driving mechanism, turning the alternate hearths in opposite directions.

The hearths are slightly arched. They are constructed of special refractory tiling. On the under side the stirring rabbles, made of the same refractory material as the hearth itself, are dovetailed in. These rabbles are so arranged that with the rotation of the hearth the ore is moved, on one hearth outwardly from the center, and on the next hearth inwardly toward the center. Each hearth thus bears on its upper side the ore to be roasted, while on its under side are the rabbles which stir the ore upon the next hearth below.

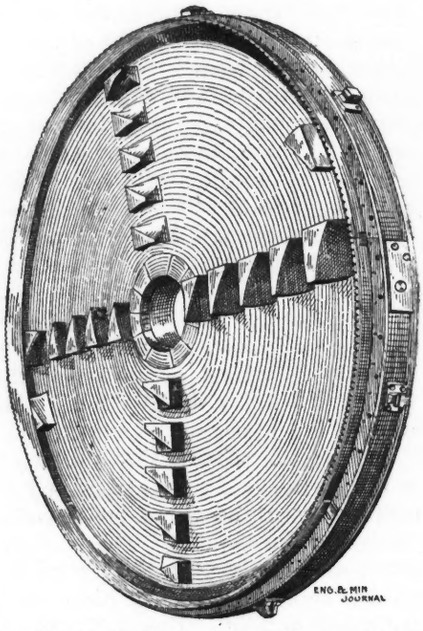
At the periphery, the roasting compartments are hermetically sealed by annular rings, which dip into the channel of the ring next below, made tight with a seal of sand or fine ore. The lowest hearth, which is stationary, is muffled, and is heated from a fire box. There are arrangements for preheating the air which enters the roasting chambers.



VERTICAL SECTION THROUGH THE SPIRLET ROASTING FURNACE

The advantages claimed for this furnace are that there are no working parts of iron within the furnace itself, and by virtue of their absence it was possible to make the distance between the several hearths very small, this being economical from thermal considerations. By avoiding iron stirrers, the cooling of any iron part is unnecessary, wherefore no heat is carried away from the furnace by cooling air or water. The cost of repairs is small, being confined substantially to the maintenance of the arches. The first furnace was in operation more than a year without any one of the stirring rabbles becoming broken. The several hearths can be easily removed, one after another, by simply lifting them out by means of a movable crane, it being unnecessary to detach a single screw or bolt. It is claimed that the quantity of flue dust produced in roasting in this furnace is very small, especially because the drop from one hearth to another is so small.

The average capacity of the Spirlet furnace is about 5000 kg. per 24 hr., with a power consumption of less than 1 hp. The labor attention is probably similar to what is required with furnaces of the McDougal type. It is claimed that the fuel consumption is less than 10% of the quantity of ore charged. With certain ores, it has been possible to make a commercially complete desulphurization without the use of any fuel. The sulphurous gas is strong, being 5 to 7% SO_2 by volume. Australian blendes have been burned down to less than 1% sulphur, Algerian blendes to below 2%, and Carthaginian blendes to 3¼%. The Spirlet furnace is in use at certain of the works of the Vieille Montagne company in Belgium, and at the smelteries at Overpelt and Engis, in Belgium, and at Stolberg, in Rhineland. The Grasselli Chemical Co. is now installing one at one of its works in West Virginia. The parts for this last furnace were wholly imported from Europe, no arrangement having yet been made for their construction in this country. As compared with the Hegeler furnace, which is in general use in the United States for blende roasting and sulphuric acid manufacture, the Spirlet furnace probably offers no advantage in first cost per unit of capacity, but in operating cost it ought to be superior. Anyway, it is a very original and ingenious design of roasting furnace.



VIEW OF ONE OF THE HEARTHS OF THE SPIRLET FURNACE

This view is looking toward the underside of the hearth, which is turned up on edge for the purpose of the draftsman and shows the stirring rabbles which are set in the masonry of the hearth.

Magnesite in 1913

There was a decrease in the output of magnesite in the United States from 10,512 short tons in 1912, to 9632 tons in 1913, according to the U. S. Geological Survey. The only production in this country was in California, as heretofore.

With the cutting off of the foreign supplies, due to the European war, however, the demand for the domestic product ought to increase, especially in view of the new and shorter water route by way of the Panama Canal to the Eastern United States. It is to be hoped that the sudden stimulus thus given to the domestic mining industry will build up a trade that will withstand the compe-

tition that must undoubtedly ensue when normal trade conditions are again established.

The demand for the domestic product is restricted to the Pacific Coast and Rocky Mountain region, as it has been impossible at the present railroad freight rates to ship to the points of largest consumption in the East.

Kirkland Lake District, Ontario, Canada

By H. W. Hardinge*

The Kirkland Lake district of Ontario is situated in Teck and Lebel Townships, about seven miles northeast of the Swastika station on the Timiskaming & Northern Ontario Ry. This section is practically intermediate between the Cobalt silver and the Porcupine gold districts.

The gold-bearing, as also the barren, veins appear as fractures mainly in a conglomerate formation, along which are intrusions of a reddish feldspathic-porphyry. These veins, after formation and secondary movement, have evidently been the courses of siliceous gold-bearing solutions. The conglomerate formation is not materially different from that of the silver-bearing district of Cobalt; the genesis, however, of both the gold and silver in these districts, as well as that of Porcupine, are, in my opinion, similar, i.e., the result of intrusive solutions acted upon by great pressure and heat, independent of character of country rock. This opinion may be subject to criticism by local authorities, still I am firmly of the belief that the mineralization in either gold or silver, and in fact all the mineral contents of the veins, is not the result of segregation or mineralization from the country rock. Local opinion in the Cobalt district appears to credit the silver contents of the veins to the diabase as the generic matrix.

When I made my report on the Nipissing mine about eight years ago, I met with considerable opposition in view of the positiveness with which I asserted that the silver, together with its calcite matrix and other associated minerals in the silver-bearing veins, were the result of a deep-seated aquo-thermic action, and in view of this fact the mineralization of the veins would penetrate to considerable depths, at least up to the point of decreased pressure and heat commensurate with precipitation. The matter of depth (over 800 ft.) has now been proven. I refer to this in view of the positive statement I am about to make relative to my opinion of the permanency of the Kirkland Lake district, which is, that the gold-bearing ores will penetrate at least as deep as they are traceable upon the surface. My theory is that these veins are sections of a plane cut through a lens-formed fracture, which has been sheared across by glacial action and into which the solutions had previously penetrated. Not all the solutions carried gold—hence, the barren veins.

The gold in the Kirkland Lake veins not only shows in the parent vein of quartz along the strike of the porphyry intrusion, but is also associated with the veinlets of quartz which intrude into cracks, due to the shrinkage in cooling and shifting of formation during geologic stress, which latter has resulted in small gold-bearing stringers running out from the main vein into the country rock.

It is hardly to be expected that the veins which have been found, owing to the fact that they occur upon protruding bosses of the higher ground, denuded of vegetation, are the only veins which will be discovered in the district, nor will all the veins be gold bearing although similar in other respects. The formation of the country for miles around gives evidence of a successive number of these veins in the conglomerate and porphyry. All of the veins are of a more or less general similar physical appearance, but it must not be expected that they will all contain gold, for there are no doubt a number of veins which have not been the channel for auriferous solutions. Many disappointments are bound to result, as is usual in the development of all districts, by the anticipation that because of the similarity of physical appearance veins must necessarily carry similar results in gold or silver values.

Glaciers have done a vast amount of development in the Kirkland Lake district, as in other sections of Ontario, and the present outcrops in all three districts above mentioned are hundreds of feet below the original surface Nature has done development which the enthusiastic prospector should not overlook; he should realize that he is now standing upon the third, fourth or tenth level of his newly discovered vein. The present surface has been mined down hundreds of feet by this glacial action.

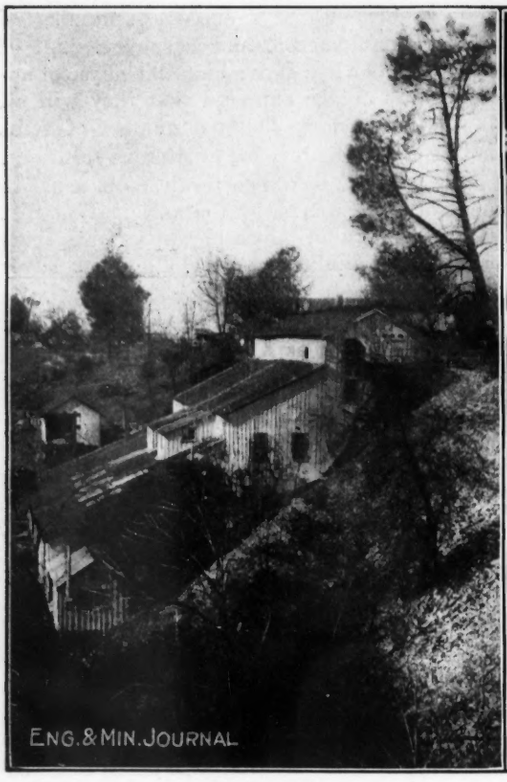
Referring particularly to the Tough-Oakes property in the above mentioned section—few gold mines can sort ore on a picking belt with little else than the metallic gold as a guide, as is being done at this property. The shipping average of such picked ore in carload lots is about $500 in gold per ton. The low-grade ore, ranging from $100 per ton downward, is partially extracted in a 5-stamp mill, the rich tailings being reserved for future reworking. This property has now been developed by a shaft to a depth of 300 ft. with drifts from 100-ft. levels, making a total development of over 1500 ft. Throughout this total development of the Tough-Oakes, gold was encountered, all headings being in ore at the time of my visit. At least 90% of the vein extraction is classed as ore, although the gold content varies considerably, still the total material extracted in development has a high average value.

Ontario is destined to be a large producer of gold, which statement is directly contrary to the opinion I entertained of Canada, previous to my later 10 years of critical investigation of its gold, silver and copper districts. Its possibility is hardly appreciated by the engineer who has confined his professional work to districts entirely outside of Ontario. The engineer would be called upon to set aside many of the fixed theories and practices, in his work in other districts of the world, in order to comprehend the possibilities of the Ontario district.

Few of us comprehend that the Cobalt silver district alone, comprising a section of not to exceed two miles in width and two to three miles in length, has annually, for the last six or eight years, produced one-half as much silver as the total production of the United States (in other words, produces approximately 30,000,000 oz. against 60,000,000 oz. for the United States). The Kirkland Lake district, together with that of Porcupine, and other as yet undiscovered sections of Ontario—figuring from analogy—are bound to make enviable records for themselves.

*Mining engineer; president, Hardinge Conical Mill Co., 50 Church St., New York.

Photographs from the Field



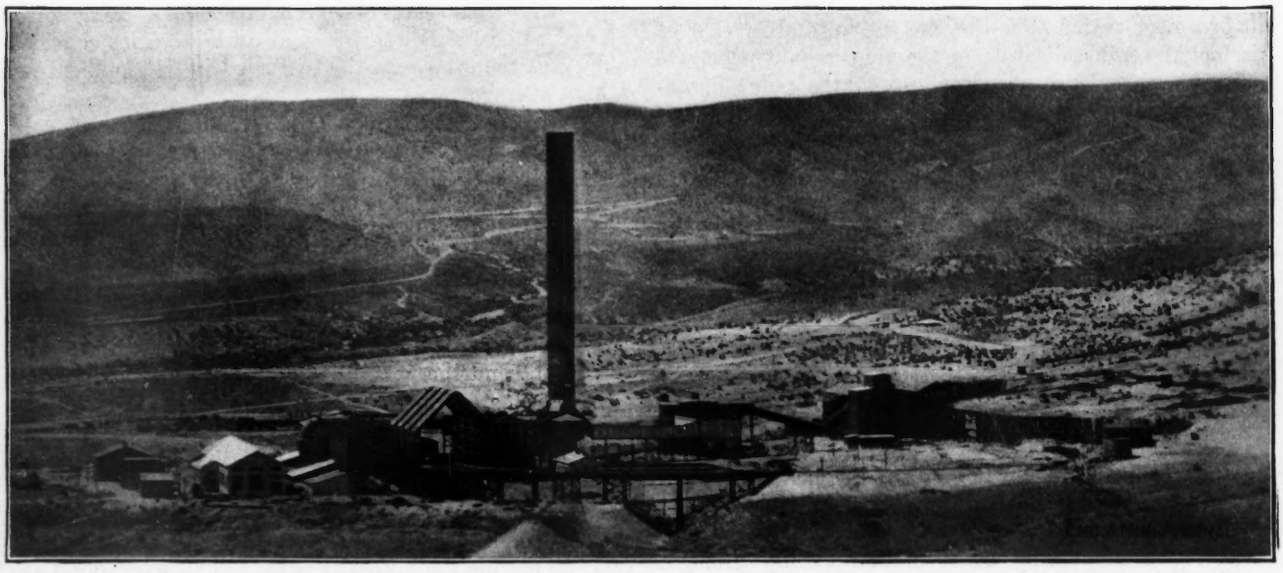
BLACK OAK MILL, SOULSBYVILLE, CALIF.

The first all-sliming cyanide mine in California

CHINESE PLACER MINERS, CALIFORNIA

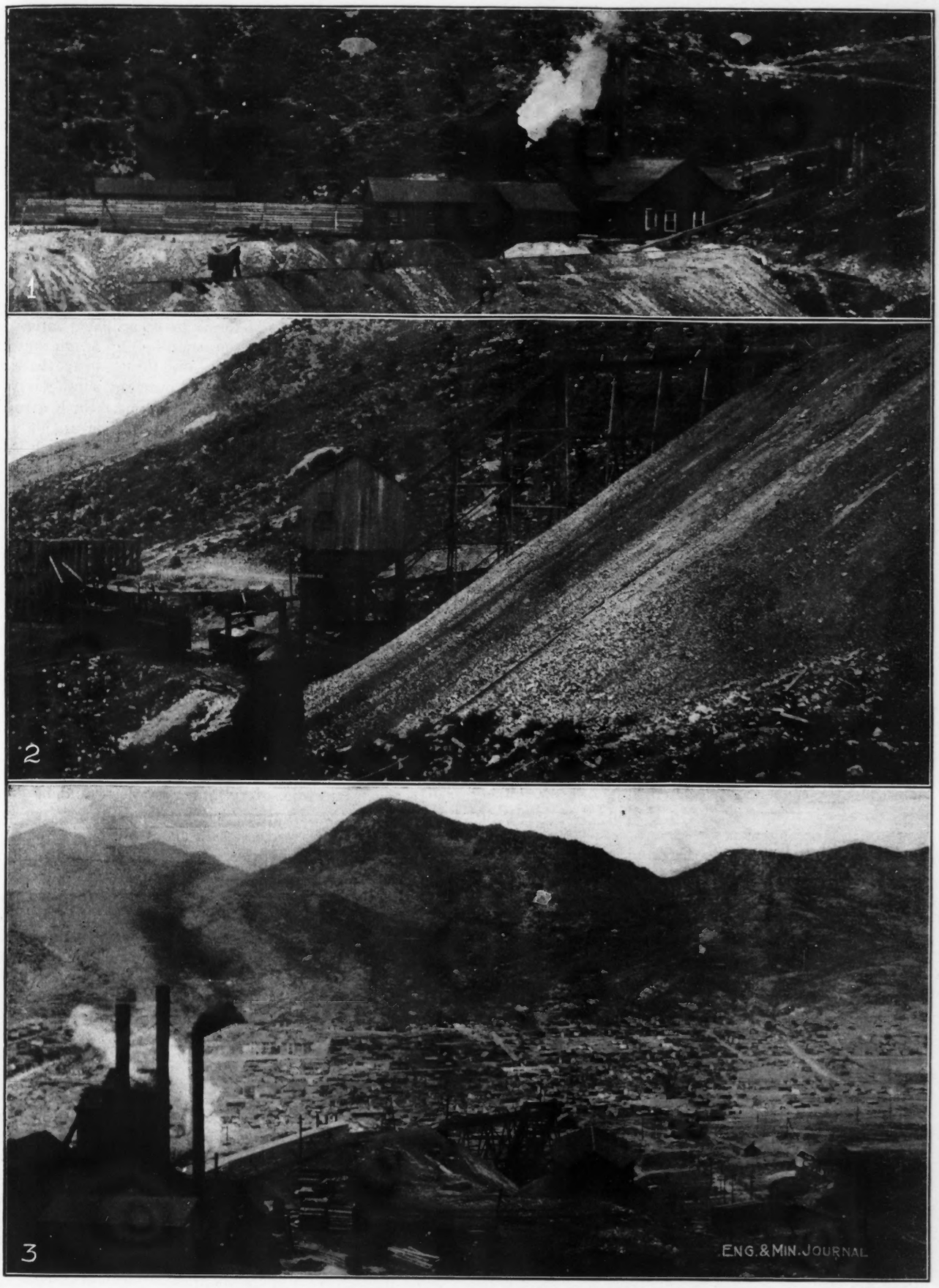
SMUGGLER UNION MILLS, TELLURIDE, COLO.

Concentrator and cyanide plant operating on gold-silver ore



NEW UNITED VERDE SMELTING WORKS, CLARKDALE, ARIZ.

The new works of the United Verde Copper Co. is nearly completed. It comprises six Wedge roasters, four 48x320-in. blast furnaces, three reverberatory furnaces and four upright converters. The new plant is on the Verde River about five miles from the mine which is at Jerome.



EAGLE & BLUE BELL MINING CO.'S PLANT, EUREKA, UTAH

1. East view of plant. 2. Ore bins and trestle. 3. Looking north over town of Eureka.

Editorials

Copper

The conditions of copper merchandizing are gradually regaining their equilibrium, but although domestic manufacturers have been taking considerable copper and, moreover, a considerable quantity of copper has been exported to Europe, the situation as it exists upon the basis of the curtailed production is still very far from being settled. As to just how far it is from being settled, opinions differ. Certain producing interests express themselves as feeling fairly comfortable. Others, and they are the majority, express themselves in a different way.

American consumption is probably now in the neighborhood of 40 million pounds per month, and the brass mills, wire drawers and other manufacturers have probably depleted the stock in their yards to a low figure; anyway, they have lately been buying more copper than previously. However, the copper that they are taking is still partly on old contracts, some of which run into October, we understand.

Among the foreign consumers, England and Italy, especially the former, want copper. France, apparently, wants very little. Germany, on the other hand, is evidently in great need of copper and willing to pay a high price for all she can get. Unfortunately, sellers cannot get any to her. Certain events of the last week illustrated this and also the difficulties and uncertainties of the present situation.

Shipments of copper were being made from New York to Rotterdam. The British Government suspected that the ultimate destination of this copper was Germany. Consequently, copper was declared to be conditional contraband of war, three cargoes in Holland-American ships were seized, arrangements were made to transfer stocks of copper in Rotterdam to England, and the Holland-America line announced that it would not take any more copper shipments.

This practical closure of the Dutch market, the risk of seizure at sea of copper going to any quarter, the high rates of insurance, the wild fluctuations in the rate of exchange, and the difficulty of arranging credits for the payment for the copper bought, all contribute to the complication of the export business. The London and Hamburg metal exchanges remain closed, on the latter there was complete liquidation by order of the German Government, and their opportunities for speculative equalization of commercial transactions no longer exist.

Until recently, the copper sent abroad, since Aug. 1, has been chiefly on the filling of old contracts or on consignment, i.e., the shipper sends the copper abroad on his own account for sale in some foreign market when opportunity may arise. In such way, advantage has been taken of the high prices prevailing at certain times in certain foreign markets. The old condition of a practically uniform international market, based on New York, with the ordinary freight differentials, no longer exists. Nor is there any longer any business in contracts for future deliveries, all of the present sales being for immediate shipments. Recently Europe has been placing some fresh orders in this market. The prices realized have been rather widely variable.

In the purely domestic market the producers have refrained from exerting any pressure to sell. Consumers have been supplied with whatever copper they have wanted, without there being any sharp competition for their business. In some cases they have simply been supplied with copper, leaving the terms to be adjusted later; in other cases, they have been supplied at a guaranteed price, which is practically the same thing; in most cases, however, the copper has been sold outright, most recently at the price of about 12c., regular terms. Such a price shows simply the figure at which copper is available and does not in any way reflect an open market in which sellers are free to act.

If there was an open market, with active competition, forced sales, etc., the price of copper would probably go down sharply. Nobody wants to see this, neither the producer, nor the manufacturer-consumer, nor the banks. The interruption to business on Aug. 1, suspended payments, either by virtue of the moratoria or otherwise, for copper sold abroad and the stocks piling up on this side resulted in a great accumulation carried. The banks have viewed copper as collateral in the same light that they have viewed as collateral the securities listed on the stock exchanges. Everybody is hoping that things can be held about as they are. When the revival in the copper business comes, as sooner or later it will come, it would be better for everybody to start upward from a level of 12c. than from a level of 11c., or even 10c.

In the meanwhile, everything possible should be done to preserve the situation that exists, or rather prevent it from becoming worse. Talk about big buying of copper, firmness of the price, etc., is all nonsense. Such firmness as there may appear to be is simply because there is no pressure. It is the firmness of the reed that does not bear any load. Safety lies in avoiding any further strain on financing. Lucrative refining and selling contracts have lately been turned down, because financing was involved. Production should be kept severely curtailed. There is profit to but few producers in selling copper at 12c. It is better that the resources of a mine be conserved than be sacrificed.

What Mines Use

Every mine of any consequence whatever, and the number of such mines is large, is a great purchaser of a long list of supplies of a thousand sorts. It is only in the case of the very large mining companies that such supplies are scientifically purchased, cared for, distributed and accounted for.

Everybody knows that any article can be bought more cheaply in quantity than it can by retail, but a good many mine managers do not know how to buy advantageously by wholesale, because in the first place they do not know how much of each article they use during a given period.

For the lack of such knowledge some managers doubtless lose money in buying quantities, wholesale purchases not being in every case the most economical. Speaking generally, articles of regular consumption ought always to be bought by wholesale, but articles of only occasional requirement may often be purchased more economically from the local hardware dealer at a higher price than at a lower price at a central supply point if such article is to remain unused at the mine for several years.

The purchase of the supplies of all kinds for use at any mine, and the distribution of such supplies among the several departments of the mine ought to be done through the medium of a mine store, which ought to be conducted just as if it were an independent business. In conducting such a business the successful storekeeper sees to it that he does not carry too much slow-moving stock on his shelves, that his goods required constantly are always on hand, that his purchases be made on the most favorable terms and at such times and in such ways as will bring transportation, carting and handling charges to the minimum. The mine storekeeper ought to run his business in the same way.

Being convinced that many mine managers give insufficient attention to this department of operation, we undertook to prepare an article about it, going a good deal into detail. We conceived that it would be both interesting and surprising to show the great variety and great quantity of mine supplies that are used in important operations. Managers of several important companies, including the Nevada Consolidated, the Miami, the Hollinger and the Franklin mine of the New Jersey Zinc Co., courteously assisted us in this by giving us lists of their purchases during certain periods of time. These companies will exemplify mining conditions in several parts of North America and of several kinds. The Hollinger is an important gold mining and milling company, the Miami is one of the famous porphyry coppers, mining its ore by the caving system and operating a large and elaborate mill for the concentration of the ore. The Nevada Consolidated is a porphyry copper, which operates both an underground mine (the Veteran) and a steam-shovel, open-pit mine (the Copper Flat). The Franklin mine is one of the great mines of the East, being indeed the most important zinc mine of North America, which is situated within 80 miles of the City of New York. The publication of this article, which will run through two or three issues, begins in this number.

A Trial of State Price Fixing

Substantial equilibrium seems to have been restored in the petroleum market, petroleum being one of our great export commodities and having suffered from the derangement of the war, like copper and cotton. The Eastern refineries, which were put on half time, are now reported to be working at full rate once more and the embargo on production has been lifted at the wells.

Thus has one of our great industries been straightened out, i.e., in most districts except Oklahoma. That state, which has marked "progressive" tendencies, has a sort of a trade commission, which has the power of fixing minimum prices, at least in cases where unholy corporations are concerned. This commission recently fixed 65c. per bbl. as the price below which crude oil might not be purchased. Last week the Prairie Oil & Gas Co. reduced its buying price to 55c., figuring that as what it could afford to pay with present market conditions and requested the state commission to recognize that price. The commission refused, whereupon the company announced that it could not take any more oil from Oklahoma and consternation fell upon the producers.

Here is an illuminating example of the working of state regulation of prices. The state, of course, at the behest of the producers, says that oil must sell for at least 65c. per bbl. The corporation says that market conditions do not permit that price and that if it can't buy for less it can't buy at all. But apparently the producers do not like this condition, although they do not see what they are going to do about it.

Antimony Production

If antimony remains up around 10c. per lb., we ought to witness a revival of antimony mining in this country. From Arkansas, Utah, Nevada, California and Idaho are coming reports of antimony mines being reopened and we are receiving many inquiries as to where the ore may be sold.

The only antimony-smelting works in the United States is the plant of the Mathison & Co., on Staten Island, in New York harbor, which has been idle for several years. We understand that its owners have no plans for immediate resumption of smelting, but the plant can be put in operation on short notice. The agent for this works is Edward Hill's Son & Co., of New York.

Any of the dealers in ores whose advertisements are to be found in the advertising pages of the JOURNAL will be glad to negotiate business in antimony ore. Also, no doubt some of the lead smelters would be interested, inasmuch as they can smelt antimony ore with lead ore and make antimonial lead, which for many purposes is just as useful as smelting for antimony itself.

We shall be glad to assist our readers in promoting the buying and selling of antimony ores and any other kinds of ores. However, we suggest that the quickest way to inaugurate new business is by making use of our advertising pages. If you have antimony ore to sell and do not know where your best market is, advertise what you want to sell. If you want to buy antimony ore, advertise for it.

When the official quotations for silver were suspended at the beginning of August for the reason that it was then impossible to sell silver, the smelters were relieved of obligation to pay for the silver in ores consigned to them, the basis of settlement agreed upon in the contracts being temporarily nonexistent. However, the smelters offered to make an advance upon account of the silver and settle in full when silver could once more be sold. Most shippers of ore, etc., accepted this proposition, intelligently recognizing the fairness of it and the nature of the great emergency that had arisen. But there were some who demurred. One smelter met such objections by offering to hand back the silver itself. "We owe you for 200,000 oz. of silver," it said to one shipper. "We can't pay you according to our contract because we cannot sell any silver, nor is there any quotation. But here is 200,000 oz. of refined silver. Take it and sell it yourself, if you can." The miner took this silver, but long before he had succeeded in disposing of it the smelter was making final adjustments with its clients at a far better price than the smart miner ever succeeded in realizing.

BY THE WAY

The will of James B. Haggin was filed for probate on Sept. 17 and, according to the *Times*, the estate was valued at $15,000,000, an amount much lower than was popularly supposed to represent Mr. Haggin's fortune.

The transmission line from Cedar Rapids in the St. Lawrence River through Cornwall to Massena, N. Y., is now nearly completed. It is 45 miles long and is expected to transmit 85,000 hp. The transmission wire is of aluminum. The telephone line, which is built alongside the transmission line, also has aluminum wire.

Down in Mexico there is a certain locality which a British explorer characterized as being "better adapted for habitation by eagles than by men." An American mining engineer examined a property at the place in question, and, his employers' rule being that each report should be filled in on a standard skeleton form, he naively dashed off the following:

GEOLOGY

"I have carefully examined the geology of the district in which this mine is situated, and find that the geology is highly satisfactory."

In the early '90s some Columbia School of Mines students studied practical mining at the Tamarack, on the Upper Peninsula of Michigan. The miners had a habit of singing hymns on the man cage, but were greatly shocked one day to hear some of the students sing a song consigning the faculty to a region much lower than the bottom of the shaft. One remarked to the hoisting engineer, "they be sinful lads." By some strange misunderstanding of signals, amounting to what might be called a coincidence, the cage which lowered the students the following morning went at approximately ore-cage speed or perhaps a trifle faster for part of the trip. After that, "Lead, Kindly Light" and "Why Not Now?" were the favorite college songs for underground use.

All eyes are now turned to South America to discern its commercial possibilities. We shall doubtless see and hear many things "that ain't so," both in mining and in trade. For example, the geological possibilities of the Turyassu gold field in Brazil are most extraordinary, if we are to believe an "engineer's" report recently submitted. It says: "Some gold-bearing fissure veins are known, but the gold deposits occur mostly as bed veins. The mineral contents of these bedded veins appear to have been introduced by fissures and are not due to surfacial sedimentary deposition. The form of these gold veins is probably due to a large extent to the softness and volubility of the rocks in which they occur, etc." We hope that most people who contemplate mining in South America will be more fortunate in the selection of their engineer.

A gentleman whose intentions may be perfectly honorable has been trying for some sixteen years to "finance" different schemes for working gold placers in a district not many hours from New York City. A reply to his postal-card *feeler,* prompted by inceredulous curiosity, eventually led to his sending the report of his engineer. The report stated that on this 150-acre tract over 2000 measurements showed a superficial area of 1,795,200 sq.yd. of gold-bearing gravels, with an average depth of 3 yd., giving a grand total of 5,385,600. Pretty good showing for only 150 acres. "Exhaustive tests," made under adverse climatic and other conditions and therefore "undoubtedly conservative," showed an average of 78c. per cu.yd., making $4,180,788 worth of gold to be taken from the property. Inquiry and protest over 1,795,200 sq.yd. of gravel on a 150-acre tract brought forth the interesting reply that perhaps the engineer made some mistake in his figures and perhaps he was not as careful as he would have been if he had been paid his usual fee of $100 per day; but the report had been made as a return favor in acknowledgment of gratitude for being guided about to different offices in New York City, where the engineer had come as a stranger.

Here is an interesting case taken from Quinlan's History of Sullivan County, New York. "Daniel Niven came to Wurtsboro in 1812. * * * Daniel Gonsalus gave him information which led to the discovery of the Wurtsboro lead mine. The pioneers of Mamekating knew that the Indians obtained lead near Wurtsboro; but the latter obstinately refused to reveal where it was to be found, and became very angry whenever the subject was broached. A white hunter named Miller followed them at the risk of his life, until he ascertained that they obtained the ore on the west side of the Shawangunk, near a cluster of hemlocks, which was plainly visible from the valley. He heard them at work, and after they left, found the mine. When Miller was old and infirm, he intended to show Daniel Gonsalus where the ore was. He pointed out the hemlocks, and promised that, as soon as he had visited some friends in Orange County, he would go with Gonsalus to the point where the lead was visible. Before Miller returned from his visit, he was taken sick at Montgomery, and died. Gonsalus never attempted to find the ore. In 1813, he told Niven what he knew, and after thinking of the matter for years, the latter hired one Mudge to help him make a search. They were successful. A quantity of the galena was sent to Doctor Mitchell and others, chemists, who declared that it was valuable. Mr. Nivens made a confidant of Moses Stanton, a neighbor, who, as well as Mudge, insisted on sharing the profits of the discovery, and the three became partners. Not long after, those who had analyzed the ore were anxious to purchase the mine; but Nivens & Co. could not sell it. They were not its owners and they could not ascertain who were. So the matter rested until 1836, each agreeing to make no disclosure without the consent of all three. Their secret, however, was revealed after it had been kept for almost 20 years. Stanton had a habit of talking in his sleep, and while his eyes were closed, spoke of the mine in such a way that his son, who was present, had no difficulty in finding it. The young man found the owners, and made some $500 by keeping his ears open while his father *dreamed aloud.*

PERSONALS

J. Parke Channing is recovering steadily from his recent operation.

J. Nelson Nevius is a candidate for state senator from the 36th district of California.

Edwin S. Berry, of Pope Yeatman's staff, who has been at Chuquicamata, Chile, for a long time, has returned to New York.

James A. Richards, late at Royal View, Alberta, has been appointed district inspector of mines for the Calgary district, with headquarters at Calgary, Alberta, Canada.

L. D. Ricketts has been spending a few weeks in New York. He will go to Arizona next week, but expects to be back in New York next November or December.

H. F. Noyes, formerly general superintendent of the Dayton Coal & Iron Co., has been appointed superintendent of blast furnaces for the Broken Hill Proprietary Co., Ltd., Newcastle, New South Wales.

H. C. Hoover was expected to visit the United States this fall, but has been detained by his numerous activities in London, and now does not think he will be able to cross to this side until after the end of the year.

Dr. O. Sussman returned last week from Europe. He was in Germany for six weeks after the outbreak of the war and reports that neither he nor other Americans experienced any serious difficulties in leaving the country.

OBITUARY

John C. McLeod, one of the wealthiest citizens of Charlottetown, P. E. I., died suddenly of heart failure on Sept. 22, aged 68 years. He was one of the pioneer prospectors of the Yukon, having been engaged in gold digging there 10 years before the rush of 1898 to the Klondike.

William H. Allen was killed, Sept. 9, at the Coe mine, in Grass Valley district, Nevada County, Calif., while engaged in directing the taking down of the old stamp-mill building, from which he fell. He was a well known miner and had made a fortune in South African mines. He returned to California a few years ago; but, although provided with a competence, never seemed contented unless engaged in some occupation around the mines.

Edward Muldoon died at Oakland, Calif., Sept. 18. He was among the early miners in the Mother Lode region, and for many years owner of the Muldoon mine at Jackson, Amador County. This is the mine that was claimed by the Kennedy Extension Gold Mining Co. to have the apex of the Argonaut vein, over which a long legal battle was waged, and which was decided in favor of the Argonaut. Mr. Muldoon had resided at Oakland for 20 years prior to his death.

Joseph E. Gay, for many years well known in the Lake Superior copper-mining industry, died in New York, Sept. 28, aged 82 years. Notwithstanding his age, he retired from active business only a few weeks ago. He was for many years associated in business with the late John Stanton, and succeeded him as president of the Mohawk, the Michigan and the Wolverine copper companies. He was president of the Atlantic Mining Co. over 25 years. He owned some large tracts of land in Michigan, which have not yet been developed. Besides his copper interests, he was a director in the American Coal Co. and the Ohio & Kentucky R.R. Co. Mr. Gay was never married.

Charles Xavier Larrabee died suddenly, Sept. 16, at his residence at Billingham, Wash. He was born in New York state in 1843, and went to Wisconsin at an early age. He went to Montana in 1875, and worked as a miner for several years. The opportunity having been granted him, he sank 40 ft. of the shaft of the Anaconda mine for a half interest in that property. Later, he developed and sold the St. Lawrence mine. At one time Mr. Larrabee owned the Mountain View mine in Butte. With the proceeds from the sale of some of his mining property, he purchased the Brooknook farm, in Madison County, where he indulged his passion for fine horses, being credited with having bred and raised some of the finest stock in Montana, with which for a time he disputed honors with Marcus Daly. In 1887, he moved to Portland, Ore., and in 1890 to Billingham. He became owner of large tracts of land in Oregon and Washington, including some mining property.

SOCIETIES

American Institute of Mining Engineers—The first annual meeting of the Utah Local Section will be held in the assembly room of the Commercial Club, at Salt Lake City, on Saturday, Oct. 10, at 8 p.m. The principal business before the meeting will be the election of officers for the ensuing year. The committee appointed to nominate candidates for the offices has submitted the names of R. C. Gemmell for chairman, C. W. Whitley for vice-chairman, and Ernest Gayford for secretary-treasurer.

International Engineering Congress—The attention of the engineers of the world is being more and more drawn to the program of the International Engineering Congress which is to be held in San Francisco in 1915. The interest which has been aroused in foreign countries is shown by the fact that at the present time there have been received enrollments and subscriptions from 42 such countries. It is furthermore to be noted that of the present total enrollment, approximately 25% is from countries other than the United States. The number of subscriptions from the members of the five national engineering societies of the United States under whose auspices and control the congress is being held is, however, not so gratifying. The percentage of the total membership of these five societies represented by the subscription list is only 3.7. It is probable that this is largely due to the fact that the date of the congress is still somewhat in the future. This, to a considerable degree, handicaps the work of the committee on management, and it is extremely desirable that as many as possible who intend to subscribe should do so at an early date.

INDUSTRIAL NEWS

The McIntyre-Porcupine Mines, Ltd., has contracted with the Merrill Metallurgical Co. for Merrill zinc-dust precipitation apparatus and process rights for a treatment of 800 tons of solution daily.

Among the recent orders received by the Dorr Cyanide Machinery Co. are 11 Dorr thickeners, part of them of the tray type, for the Aurora mill, recently purchased by the Goldfield Consolidated Co.

The St. Louis & Refining Co. of St. Francois, Mo., and Collinsville, Ill., is revising its catalog files, and manufacturers of goods such as it might use are requested to send two copies of their catalogs to both offices.

Dorr continuous decantation equipment, together with agitators and classifiers, have been recently ordered by the Benguet Mining Co., of Philippine Islands, the Corriman Mining Co., of Colorado, and the Pittsburgh Dolores Mining Co., of Nevada.

The A. M. Byers Co., manufacturers of Byers genuine wrought-iron pipe, has recently placed in operation a new galvanizing plant at its mills in Pittsburgh. The Byers galvanizing operation provides for a careful weighing and inspection before galvanizing, a device for turning the pipe in the bath; an extra long cleaning period; pyrometer-regulated ketties, and a final weighing that assures the proper amount of coating for which the texture of the wrought-iron pipe is said to offer a base of the most favorable quality. The Byers galvanizing specifications call for a coating of highest grade "prime western" spelter and a deposit 100% heavier than that required in Government galvanizing specifications.

D. D. Herr, sales manager for Arthur G. McKee, consulting and contracting engineer, Cleveland, Ohio, returned from London, Sept. 4. While in Europe, Mr. Herr closed a contract with the Russo-Asiatic Corporation of London, covering the design and construction of three large terminal coal- and ore-handling plants along the Irtish River in Siberia. The design of this work will be started immediately; the fabrication and construction work will be withheld pending the termination of the war in Europe. Mr. Herr was prevented from visiting the south of Russia due to the sudden declaration of war. The handling capacities for proposed terminals are as follows: Ust Kamenogorsk Terminal, 100,000 to 150,000 tons of zinc and lead concentrates to be handled from 15-ton railway trucks into 250-ton barges. Concentrates will be delivered to terminal along the Irtish River from mines in the interior. Ore will be loaded into barges and delivered to destination during six months of the year. Seventy-five per cent. of the above tonnages will be delivered to the terminal in bulk, and the

remaining 25% will be shipped in bags of approximately 225 lb. each. Ekibastous Terminal, maximum of 500,000 tons of coal to be loaded during six months of the year from railway trucks into barges. Barges will have a carrying capacity of from 250 up to 2500 tons each. Coal will be mined at Ekibastous, a town approximately 75 miles interior, and will be delivered over the existing railway owned by the corporation to the town of Ermak on the Irtish River. Ermak is approximately equidistant between Ust Kamenogorsk and Omsk. Concentrates from the Ust Kamenogorsk terminal will be unloaded at Ermak and will serve as a return haul in the railway trucks to the Ekibastous plant, where the smelting works will be situated. The objective point for a large tonnage of the coal will be the Omsk terminal, which will have an unloading capacity of approximately 200,000 tons of coal in six months; 100,000 tons of this coal to be handled through the plant to railroad cars, the remaining 100,000 tons to be put into storage and reloaded into cars during the closed season for navigation.

TRADE CATALOGS

Western Electric Co., New York, N. Y. Catalog. Telephone Cords. 16 pp. Illus, 10½x8 inches.

Smooth-On Mfg. Co., Jersey City, N. J. Smooth-On Instruction Book, No. 15. 104 pp., illus. 6½x4½ inches.

Tate-Jones & Co., Inc., Pittsburgh, Penn. Catalog. Appliances for Burning Fuel Oil. 32 pp., illus. 11x8½ inches.

Easton Car & Construction Co., Easton, Penn. Catalog. Industrial railway material and cars. 52 pp., illustrated; 8x10½ inches.

Nordberg Mfg. Co., Milwaukee, Wis. Bull. No. 23. Steam and Air Hoists. 40 pp., illus. 8x10½ in. Bull. No. 24. Electric Hoists, 24 pp. 8x10½ inches.

Epping-Carpenter Pump Co., Pittsburgh, Penn., Bull. No. 102. Piston Pattern Pumps. 40 pp., Illus., 11x8½ in. Bull. No. 103. Center Packed Plunger Pumps 62 pp. Illus., 11x8½ inches.

Ingersoll-Rand Co., 11 Broadway, New York, N. Y. Catalog Form 4033. "Little Tugger" Hoist. Eight pp.; illustrated: 9x6 in. From No. 8013, "Little David" Pneumatic Chipping, Calking and Scaling Hammer. Twelve pp.; illustrated; 9x6 in. Form No. 8207, "Little David" Pneumatic Drills. 36 pp.; illustrated; 9x6 inches.

Hill Clutch Co., Cleveland, Ohio, Catalog No. 11. Power Transmission Machinery. 224 pp., illus., 6x9 inches.

The Hill company, established in 1886, has furnished a great deal of transmission machinery for mills and smelteries. The present catalog is most complete, fully illustrating its varied line of products, and is replete with tables of sizes, dimensions and prices, to insure ease and to guard against error in ordering.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

CRUSHING—Pebble Grinding Mill. Howard D. McLeod, Cleveland Heights, Ohio. (U. S. No. 1,110,069; Sept. 8, 1914.)

CRUSHING MILL. Charles G. Mayer, Jr., Durango, Colo. (U. S. No. 1,110,218; Sept. 8, 1914.)

DRILL—Rock Drill. John James Purcell, Burke, Idaho. (U. S. No. 1,109,782; Sept. 8, 1914.)

ELECTRIC FURNACE and Method of Operating the Same. Robert A. Bayard, Niagara Falls, N. Y. (U. S. No. 1,107,478; Aug. 18, 1914.)

ELECTRIC FURNACES—Improvements in Electric Furnaces. J. Rennerfelt, Stockholm, Sweden. (Brit. No. 226 of 1914.)

ELECTRIC FURNACES—Improvements in and Connected with Electric Furnaces. J. Rennerfelt, Stockholm, Sweden. (Brit. No. 24,850 of 1913.)

FURNACE — Metallurgical Furnace. Edward McCabe, Granite City, Ill. (U. S. No. 1,109,241; Sept. 1, 1914.)

ELECTRIC FURNACES—Stabilizing Means for Electric-Arc Furnaces. Charles Eugène Guye, Geneva, Switzerland, assignor to Southern Power Co., Charlotte, N. C. (U. S. No. 1,109,330; Sept. 1, 1914.)

ELECTRIC REFINING OF STEEL—Process of Electrically Treating, Melting and Refining Metals. Charles Aibert Keller, Paris, France. (U. S. No. 1,110,208; Sept. 8, 1914.)

EXCAVATING—Digging and Dredging Machinery. William J. Quimby, New York, N. Y., assignor to The Hayward Co., New York. N. Y. (U. S. No. 1,108,001; Aug. 18, 1914.)

EXCAVATING—Dipper Tooth. Edward S. Black, Chicago, Ill., assignor to Edgar Allen American Manganese Steel Co., Augusta, Me. (U. S. No. 1,107,253; Aug. 18, 1914.)

EXCAVATING MACHINE. Charles E. Stahl, Hartford City, Ind., assignor to Jacob B. Stahl, Hartford City, Ind. (U. S. No. 1,108,268; Aug. 25, 1914.)

EXCAVATING — Two-Part Dipper for Excavating Machines. Edward S. Black, Chicago, Ill., assignor to Edgar Allen American Manganese Steel Co., Augusta, Me. (U. S. No. 1,107,252; Aug. 18, 1914.)

FERRO-SILICO-MANGANESE—Making an Alloy of Ferromanganese and Silicon. John C. Walker, Yonkers, N. Y. (U. S. No. 1,109,640; Sept. 1, 1914.)

FILTRATION—Improvements in and Relating to Apparatus for Making and Filtering Solutions, Applicable in the Extraction of Metals from Ores and for Like Purposes. P. C. C. Isherwood, Herts, Eng. (Brit. No. 6413 of 1913.)

MINE-DOOR CLOSERS, Improvement in. T. Ramsey and J. T. Tonge, Roslyn, Wash. (Brit. No. 3703 of 1914.)

LAMP—Miner's Lamp. Richard G. Harris, Bearden, Tenn., assignor of one-third to James W. Hill and one-third to Ira W. Hill, Bearden, Tenn. (U. S. No. 1,109,415; Sept. 1, 1914.)

LAMP—Pyrophoric-Ignition Miner's Safety-Lamp. Franz Fattinger, Treibach, Carinthia, Austria-Hungary, assignor to Treibacher Chemische Werke Gesellschaft M. B. H., Treibach, Austria-Hungary, a Corporation of Austria. (U. S. No. 1,109,055; Sept. 1, 1914.)

MELTING—Improvements in Means for Stirring or Agitating Molten Metal for Melting Pots. I. Hall, Birmingham, Eng. (Brit. No. 15,323 of 1913.)

MINE CAR. Walter D. Stockley, Fairmount, W. Va., assignor to Mining Appliances Co. (U. S. No. 1,108,808; Aug. 25, 1914.)

MINING-CAR WHEEL. Alfred Bryant Day, Knoxville, Tenn. (U. S. No. 1,109,906; Sept. 8, 1914.)

MINING-MACHINE CHUCK. Frederick Nugent, Mace, Idaho, assignor of one-half to Levi R. Nugent, Missoula, Mont. (U. S. No. 1,109,865; Sept. 8, 1914.)

MINE-VENTILATING APPARATUS. William Clifford, Jeannette, Penn., assignor to Elliott Co., Pittsburgh, Penn. (U. S. No. 1,107,264; Aug. 18, 1914.)

NATURAL GAS—Process of Separating the Hydrocarbons Contained in Natural Gas. Heinrich Koppers, Essen-on-the-Ruhr, Germany, assignor to H. Koppers Co., Chicago, Ill. (U. S. No. 1,107,803; Aug. 18, 1914.)

OIL AND GAS WELLS—Method of Restoring and Increasing the Production of Oil and Gas Wells. Irwin L. Dunn, Long Beach, Calif. (U. S. No. 1,107,416; Aug. 18, 1914.)

PETROLEUM—Refining Petroleum and Its Byproducts. Eric A. Starke, Berkeley, Calif. (U. S. No. 1,109,187; Sept. 1, 1914.)

PUMP—Method and Apparatus for Pumping Liquids. Henry M. Chance and Thomas W. Chance, Philadelphia, Penn. (U. S. No. 1,109,108; Sept. 1, 1914.)

REFRACTORY MATERIALS—A Process for Fusing Refractory Materials. E. Podszus, Berlin-Treptow, Germany. (Brit. No. 27,744 of 1913.)

ROASTING—Ore-Roasting Furnace. Adolph F. Herzig, East St. Louis, Ill. (U. S. No. 1,108,906; Sept. 1, 1914.)

ROASTING—Ore-Roasting Furnace. George P. Gibson, Braddock, Penn. (U. S. No. 1,107,604; Aug. 18, 1914.)

SAFETY CATCH—Incline Safety-Catch. Stephen Morris, Newcomer, Penn. (U. S. No. 1,109,693; Sept. 8, 1914.)

SEPARATOR—Magnetic Ore Separator. Gordon Land, Seattle, Wash., assignor to Leighton Howardsmith, King County, Wash. (U. S. No. 1,109,634; Sept. 1, 1914.)

SILICON STEEL. William E. Ruder, Schenectady, N. Y., assignor to General Electric Co. (U. S. No. 1,110,010; Sept. 8, 1914.)

SMELTING FURNACE—Thomas Howard Holyroyd, Southfield, England. (U. S. No. 1,108,175; Aug. 25, 1914.)

SMELTING FURNACE—William E. Williams, Massillon, Ohio, assignor of one-half to Philip H. Holdsworth, Seattle, Wash. (U. S. No. 1,108,821; Aug. 25, 1914.)

SULPHURIC ACID—Improved Process of Manufacturing Sulphuric Acid. J. Lutjens, Hanover, Germany. (Brit. No. 6617 of 1914.)

TIMBER-TREATING APPARATUS—Henry C. Holthoff, Riverside, Ill., assignor, by mesne assignments, to Allis-Chalmers Manufacturing Co. (U. S. No. 1,109,334; Sept. 1, 1914.)

TITANIC-OXIDE CONCENTRATE and Method for Producing the Same. Auguste J. Rossi and Louis E. Barton, Niagara Falls, N. Y., assignors to The Titanium Alloy Manufacturing Co., New York, N. Y. (U. S. No. 1,106,406; Aug. 11, 1914.)

TUNGSTEN—Method of Manufacturing Alloys of Tungsten and Other Highly-Refractory Metals Related to It. Hans Kreusler, Wilmersdorf, near Berlin, Germany, assignor, by mesne assignments, to General Electric Co. (U. S. No. 1,110,303; Sept. 8, 1914.)

VANADIUM-GOLD ALLOY—Felix von Oefele, New York, N. Y., assignor of one-half to Heinrich Schweitzer, New York, N. Y. (U. S. No. 1,107,181; Aug. 11, 1914.

WASTE FERROUS LIQUORS, Process of Utilizing. William F. Oesterle, Jr., Clifford A. Beale, and Joseph McFetridge, Vandergrift, Penn., assignors to American Sheet & Tin Plate Co., Pittsburgh, Penn. (U. S. No. 1,108,387; Aug. 25, 1914.)

WELDING—Process of Welding Metals. John C. Lincoln, East Cleveland, Ohio. (U. S. No. 1,108,592; Aug. 25, 1914.

WELDING COPPER—Process for Welding Copper. Heishichi Suzuki, Shibaku, Tokyo, Japan. (U. S. No. 1,107,865; Aug. 18, 1914.)

ZINC FURNACES—Machine for Removing Slag, Ash and other Residue from the Retorts of Zinc Furnaces. Edward W. Keith, Denver, Colo. (U. S. No. 1,109,533; Sept. 1, 1914.)

ZINC WHITE—Process of Making Zinc White. Elisha B. Cutten, Erie, Penn. (U. S. No. 1,109,173; Sept. 1, 1914.)

Editorial Correspondence

SAN FRANCISCO—Sept. 23

Operations on the Comstock for the past week were encouraging. The Con. Virginia carried its two-compartment raise for a distance of 15 ft. and saved 21 tons of ore averaging $16.51 per ton. In the south compartment the vein shows a width of 30 in. with average assays of $15.62 per ton. The Mexican deepened its inclined winze 4 ft. below the 2500-ft. level, making the total depth from that level 170 ft. Union Con. advanced its west crosscut from the winze for 27 ft., making a total length of 120 ft. The face is in mineralized diorite. The Pumping Association at the C. & C. shaft held the water at all points. The No. 2 pump placed on the Riedler station was provided with gypsum insulation on the pipes to reduce the radiation of heat. In the Gold Hill group, 1026 tons was shipped to the Yellow Jacket mill, 654 tons going from the dump and 256 tons from the mines. Two bars of bullion were also shipped to the smelter. The Belcher saved 186 cars of good milling ore from the stope above the 1600-ft. level. The vein at this point is 80 ft. wide. The stope has been opened to a width of 30 ft. with milling ore on all sides.

DENVER—Sept. 24

Railroad Traffic in Colorado Has Been Interfered with by mining operations at times through caving in of stopes and in various other accidental ways, but a new sort of interruption has just developed. The Colorado & Southern has suspended all business on its line between Breckenridge and Leadville for a period not less than 10 days and long enough to permit No. 1 dredge of the Tonopah Placers Co. to dig through the right of way to reach desirable ground on the opposite side. The fact that this tie-up has not elicited remonstrance from the traveling and shipping public of that section of the state betokens loyalty to the mining industry; for it is almost certain that a shut-down of the railroad line for any other premeditated motive would have provoked restraining action at law.

The Coal Operators are Unwilling to accept President Wilson's suggestions for a three-years' truce. Newspapers expected the matter to be quickly settled but persons in position to appreciate the operators' viewpoint and to hear their versions of the difficulties to be adjusted can readily see that, while the terms of truce will probably eventually prevail, it will be only over the strong protest of the companies and after the matter has been given more publicity. The stern refusal of President Wilson on Sept. 23, in his interview at the White House with Mr. Welborn, of the Colorado Fuel & Iron Co., to listen to any modifications in his terms of settlement shows that he is acting according to convictions based upon reports made to him by his special investigators of the strike troubles. Both sides in this tough controversy must make important concessions, it is true; but there is a pronounced feeling among the operators that the proposed truce is a clever scheme concocted in the interests of candidates now before the public for election on the ticket representing the prevailing party in state politics. While nobody doubts the President's frank purpose, the project smacks of partisanship nevertheless and the operators have hopes that a little delay will perhaps bring the existence of a cabal to the President's notice.

BUTTE—Sept. 24

In the Damage Suit of Elm Orlu vs. Butte & Superior, the latter has answered and sets up a counter-claim for $100,000 worth of ore taken out of the disputed ground by Clark; the Butte & Superior claiming to be the owner thereof. The company also asks for a permanent injunction and decree of ownership.

The Third Week of Military Rule has passed without important incident. The novelty of the situation has worn off and everybody is attending to his daily duties without interference by the military authorities. Following the restoration of order, the city and county officials and the civil courts have resumed their activities, excepting the Butte police force and the forces of the county sheriff, which will no doubt remain under military rule until martial law has ceased and troops have been withdrawn. A number of professional agitators and soap box orators have been arrested, tried in the summary court, convicted and sentenced to various terms in jail.

In the matter of the habeas corpus proceedings instituted by Muckie McDonald and others, the supreme court in an oral order on Sept. 22 dismissed the application for writ of habeas corpus, maintaining that the prisoners are lawfully held in jail by the military authorities. If it is shown at the end of 30 days, however, that the civil courts in Silver Bow County are able to execute their processes and the men are still in the custody of the military, they may renew the application for writs. The date of trial of these men has not yet been decided upon.

The hearing on ouster proceedings against Mayor Duncan was begun before Judge Ayers of the tenth judicial district in Fergus County after various unsuccessful attempts on the part of the mayor to set aside the order of Judge Donlan that such hearing should take place before a nonresident judge. Among the witnesses examined were Governor Stewart, Postmaster Gillis, a number of prominent business men, councilmen, policemen, miners who had been deported and many private citizens who witnessed the destruction of the Miners' Union hall and listened to the utterances of street corner orators. The direct testimony was meant to show that Mayor Duncan had done nothing to quell the disturbances or to stop the street corner talks in which direct action was urged. County Attorney McCaffrey, assisted by Peter Breen, the accuser, and others conducted the direct examination of the witnesses. City Attorney Mackel conducted the cross-examination. Up to date the examination has brought to light nothing that has not already been reported concerning the disturbances. The defense will begin immediately. It is expected to bring out phases of the situation which are new to the general public, as well as the Mayor's reason for not having his police force interfere with the dynamiting of the hall or the street corner meetings.

In line with the new policy of independence "The Committee of Safety of the City of Butte" has been organized and between 300 and 400 men have signed a declaration of principles and purposes, setting forth that a condition of lawlessness had arisen in Butte and that therefore: "Representing no class or faction, composed of men from business, professional and labor circles, we will not tolerate the coercion of any citizen or the deprivation of his civil rights, but we will not interfere in the relations or agreements between employers and employees. We pledge ourselves that, exercising our rights as American citizens, we hereby undertake to redeem this community from the rule of those thugs and criminals who flagrantly scorn the institutions of the United States, many of them having never sworn allegiance to our flag. We pledge ourselves to answer the call when the peace of this community is imperiled, and to be prepared to meet any situation that may arise and which may require those qualities of courage and determination characteristic of the best type of American citizenship."

SALT LAKE CITY—Sept. 24

The Mine and Mill of the Ohio Copper Co. at Bingham closed down Sept. 17, following litigation and the filing of a petition of involuntary bankruptcy against the company. A statement has been issued from the local offices announcing the appointment of receivers, who have taken possession of the company's properties; a change in the management was made at the election in July, and the action taken became necessary when the true condition of affairs became known to those who had assumed control. This, with the falling copper market and attachment suits brought at the instigation of those formerly controlling the company's affairs, which were so timed as to render the company's payroll funds unavailable for the purpose for which they were intended, is stated to have been responsible for what happened. Ohio Copper recently brought suit against the Bingham Central R.R., owner of the Mascotte tunnel, through which the Ohio Copper ores are transported, for $133,000 for alleged breach of contract. The railroad retaliated by filing suit for $25,000 for unpaid transportation charges. The payrolls were tied up and receivers appointed Sept. 16. The company's assets include 120 acres of patented mining ground in Bingham and a 1480-acre mill site. The mill at Lark has been treating about 2200 tons of ore daily. Besides the mine and mill equipment, the company is stated to have equities in copper heretofore delivered to the smelter. No detailed

statement as to assets and liabilities has yet been made. Creditors have been assured by the receivers that they will be paid in full, and that the company would be reorganized and continue operations.

HOUGHTON—Sept. 26

The Only Two Mines Operating Full Time in the district are the Mohawk and Wolverine, of the Stanton group. The war necessitated a cut in wages, but the mines were fortunately fairly well sold up with their metal when the war started, and have since made several good sized domestic sales at satisfactory prices. The Stanton mines sell seven-eighths of their normal output to American consumers and are in a relatively strong position in the present situation. Wolverine mining operations now are confined to extraction below the 14th level.

ISHPEMING—Sept. 26

The Ropes Gold Mine buildings, machinery and other equipment have been sold by Corrigan-McKinney to an Ishpeming concern. The mine is situated five miles north of Ishpeming. The buildings will be demolished and the lumber used in construction work. The machinery will be sold as old iron. In addition to 14 dwellings, the buildings include an engine house, boiler house, miners' change house, blacksmith shop, office, laboratory, shafthouse and mill. There are 250,000 ft. of lumber and at least 1000 tons of iron. Corrigan-McKinney acquired the property at receiver's sale in 1897 for $30,000. The transfer included 80 acres of land. After experiments with a cyanide process for the treatment of the tailings, operations were suspended. The company sold the amalgamating plates of the mill, and it was reported at the time that it received several thousand dollars more for the gold contents recovered than had been paid for the property. The Ropes was the only largely developed gold and silver mine in Michigan. It was opened on a well defined vein of quartz lying in a schistose country rock. The shaft is 900 ft. in depth and the underground workings are extensive. During its period of activity, the Ropes produced gold and silver to the value of $650,000, the gold forming approximately four-fifths of this amount. The original company, organized and beginning to mine in 1882, was always hampered by lack of capital. The belief prevails in Ishpeming that some time the Ropes will be worked at a profit. At the time operations were suspended, the mill returns are said to have averaged $3.50 per ton. Corrigan, McKinney & Co.'s work was limited to the operation of the cyanide plant.

SEATTLE—Sept. 23

The Tacoma Smelting Co. Has Announced that until the copper market resumes its normal condition, it is prepared to make advances against shipments on a basis of 10c. per lb., without interest. This action will make possible the continuance of mining in the Alaska copper region and save properties from shutting down. The company agrees to settle for the copper at whatever price the metal is sold for, as soon as there is a copper market again.

The Gold Output of Alaskan Placer Mining for 1914 will exceed $10,500,000, according to an estimate made by J. F. Pugh, collector of customs for Alaska, who has just completed a trip through the territory. On his return to Juneau, he stated that the figure given was conservative. According to the data gathered, the Nome district will yield $4,000,000; Ruby, $1,000,000; Iditarod, $1,500,000, and Fairbanks, $4,000,000.

More Gold Will Be Produced in the Circle Country this year than last, and by 1915 it is hoped that the old camp will swell its output still further. The new Berry dredge is on the beach, ready to be freighted to Mammoth Creek. Anton Slater has just arrived with a new hydraulic plant, to be installed on Switch Creek, a tributary of Deadwood. Many claims are proving good producers and some of the properties which had been about given up are again on the producing list.

Authoritative Reports from Crow Creek, near Turnagain Arm, on Kenai Peninsula, Alaska, the scene of a recently reported gold strike, indicate that the properties held by the Alaska Crow Creek Mining Co. are promising and may develop into a large hydraulic mine. News of the strike was first reported in Cordova in August, and occasioned some excitement. The company struck its biggest pay streak earlier than had been expected, and there resulted somewhat of a stampede from the coast cities of Alaska.

The Bill For Exempting Mining Claims from assessment work in Alaska during 1914 has brought every Alaskan in the territory to his feet against its passage. Alaskans are of the opinion that wildcatters are endeavoring to put one over at Washington, and a delegation will leave Juneau within a few days to wait on Clay Tallman, commissioner of the general land office, to whom the bill has been referred and who refused to indorse it until he could hear from the people of Alaska. From the Alaskan point of view financial conditions in the United States have nothing whatever to do with the performance of assessment work in Alaska. The claims as a general rule are owned by individuals except in a few cases where large blocks of land have been acquired by syndicates and are not being developed. The miners and prospectors of Alaska are willing to do their assessment work as required by law, and if speculators want to hold their claims in the north they should be prepared to meet the same conditions. Otherwise they should turn the ground over to somebody who is willing to develop it. A respite from assessment work was granted by Congress for the Nome district last year, but that was because of a terrific storm which devastated the city and swept away hundreds of miners' cabins. Many of the claims are in places where the owners would not hear of the passage of the law before Christmas and its passage would simply favor men on the outside.

PLATTEVILLE, WIS.—Sept. 26

Mining Here Shows Considerable Activity. Operators are gradually employing more men, as the metal market conditions warrant it. During the lull in the market the operators cut down production and turned their attention to drilling and development work. The New Diggings district is still attracting attention for its contribution of new orebodies to the Wisconsin zinc field; it is interesting to know that the ore deposits are mostly found on the north sides of the hills.

The state now has a law taxing orebodies, which has proved harmful to the mining industry. Property owners, many of whom are farmers, have objected to making drilling contracts with the mining companies, or to developing lands themselves, for fear that this law would raise the taxes on their holdings; it is hoped by the people here that the law will be repealed at the next meeting of the legislature.

The Fields Mining & Milling Co. plans extensive building and development work, which includes the building of a 600-ton mill, a motor-truck ore-haulage system and the latest types of mining, and milling machinery. The Lawrence Mining Co., of Hazel Green, is about to complete its mill and get everything in readiness for mining operations. It has been reported that Kisler & Stevens have made a good strike in their property situated one-half mile northeast of the East End mine. The Wisconsin Zinc Co. has proved up an orebody on the Sietz land, near Platteville and is about to start shaft sinking. The West Hill Mining Co. is getting its milling equipment in readiness. This property is owned by local people. The North Unity Mine at Day Siding will be a producer, as soon as the mill is completed. Drilling results on the Kittoe land are good; this looks like another mine for the Vinegar Hill Co. The Mineral Point Zinc Co. is about to start work on the old Pittsburgh-Benton property.

TORONTO—Sept. 26

The Removal of the Minimum Prices at which mining stocks may be sold on the exchange has been agitated by some brokers. So far their efforts have been unsuccessful. The majority of the members took the view that this action would result in stocks being sacrificed at an abnormally low figure, and that there was no more necessity of permitting bargain-counter sales of mining stocks than of any other securities. The higher priced stocks are little affected, but some of the cheaper issues could be easily raided.

At a Recent Meeting of La Rose Directors, the regular dividend of 2% was declared, and a lengthy report on the conditions of the property was submitted by R. B. Watson, consulting engineer. Another report by P. A. Robbins, of the Hollinger mine, was also read. Both engineers advised further extensive exploration and development work. During the past few months, rumors have been current that La Rose would shortly close all its properties, as the ore in sight was rapidly becoming exhausted and the general impression prevailed that the possibility for the discovery of new orebodies was not encouraging. In the event of the closing down of the property, the surplus, amounting to approximately $1,500,000, would be distributed among the shareholders. In view, however, of the recommendation submitted at the meeting, it is now probable that work will be continued for some time. A report, explaining fully the position of the mine and the course of action thought best by the directors, will be mailed with the dividend checks. It is also stated that the last dividend was not fully earned, but was paid out of the surplus.

The Mining News

ALASKA

LITTLE GIANT (Valdez)—Claims on Mineral Creek being opened by Herbert Jaynes promise to become good producer, if vein holds out. Six tons being sacked from outcrop for mill run at Valdez. Assays had from $4.80 up. A 125 ft. tunnel gives 40-ft. backs. Outcrop shows width of 4 in. to 4 ft.

ARIZONA

Cochise County

SHATTUCK (Bisbee)—Dividend passed. Last paid, 50c. three months ago.

Greenlee County

SHANNON (Clifton)—Mines at Gleason and Metcalf closed. Smelting plant was to close Sept. 26.

Mohave County

RAINBOW (Chloride)—New pumping plant installed and sinking begun from 400- to 500-ft. level.

HACKBERRY—Qualey Bros., of New York, recently installed larger pumping equipment and new compressor. As soon as water is lowered, sinking will be resumed.

DISTAFF (Chloride)—Mine under option to John Campbell being actively prospected with excellent results. Machine drills installed and main shaft to be deepened.

Pinal County

MAGMA (Superior)—New strike on 1000-ft. level. Ore crosscut for over 5 ft., showing high copper and silver contents.

KELVIN-SULTANA (Kelvin)—Heavy rain storm damaged mine by flooding. Large dumps of carbonate ores at No. 1 shaft washed away and shaft injured. Car of ore shipped by leasers to Hayden carried 15% copper.

RAY CONSOLIDATED (Ray)—Traffic on railway between mine and Ray Junction impossible until repairs are made. Several large fills washed out. Shops at mine and upper portion of town suffered damage from high waters.

Santa Cruz County

A PORPHYRY COPPER is reported by George D. Gross, veteran prospector, with several good discoveries to his credit. Deposit lies in the Patagonia Mountains, 15 miles northwest of Nogales; quartz-porphyry rock with disseminated chalcopyrite; shows 700 ft. in width and two miles in length on the surface. Assays stated to increase regularly to 2½% in going down. Thought by neighbors Mr. Gross has made valuable discovery.

THREE STARS (Patagonia)—Mine leased by agent of old Apache Co. to John and Chris H. Schultz, of Denver, who will begin work at once on new shaft. Ore carries lead, copper and silver.

CONGRESSIONAL (Patagonia)—Property of Josiah Bond examined by Kirby Thomas, for New York people. Is deposit of copper ore, with large surface showing, but is opened only to 75 ft., giving good promise at that depth.

BRADFORD (Bluxton)—A. L. Harroun, who purchased old Salero mines from Ferry estate, removed boilers and some other machinery to Bradford mine, near Bloxton. Will not tear down buildings, being minded to give Salero one more try. Shaft on latter is down 400 ft. with good indications; is proposed to sink to at least 600-ft. level, as showing on 400 level warrants further work.

O. K. (Patagonia)—This group, formerly known as the Glove, property of the Sheehey boys, now being worked by the O. K. company, with about 40 men under T. M. Parks. Ore shipped to El Paso and elsewhere. Is difficult and requires care to keep the lead and zinc apart. Lead goes to El Paso. Has been stated that El Paso works would be equipped with zinc retorts, but so far nothing has been done. Zinc goes to Colorado or Kansas and Missouri for treatment. Up to middle of September, seven cars had been shipped, and production goes on at rate of 20 tons per day, most of which can be shipped. Thought that mill will be necessary.

FLUX (Patagonia)—Richardson has bonded this mine to California operators represented in field by Bierce Bros. & Collie for last three months; they made careful investigation, and many concentrating tests on ore, before entering into contract. Large tonnage developed as result of former work, will run about $12, and parties have contracted to install concentrator; location to be announced later. Buyers have commenced work and will devote energies to prompt construction of works and additional development. Sale means much to district, as standing of engineers assures adequate treatment of immense bodies of ore in mine and consequent heartening of others with similar bodies of milling ore.

R. R. R. (Patagonia)—N. L. Amster, after working under bond and lease for two years, shipping more than million dollars' worth of copper ore, gross, and operating at profit, has thrown up contract. War partly responsible, but immediate cause is result of Heney-Richardson trial, involving title to part of mine. Heney & Richardson were originally partners in mine, but Heney got "cold feet" and sold out to Richardson for $5000, his interest being approximately one-third. Latter, being game, drove long tunnel hitting vein at 600 ft., and opening up body of ore, on strength of which he sold to Amster. Later, Heney commenced suit to set aside deed, on ground of Richardson's having made development, without imparting result to Heney. Suit ended in verdict for Heney, but so much extraneous testimony was introduced that Richardson is applying for new trial. Failing that, case will be appealed to Supreme Court; and new trial will in all likelihood be ordered by one or the other court. Case attracted attention, being argued for plaintiff by Frank Heney, well known lawyer of San Francisco, and for defendant by Frank Hereford, chancellor of University of Arizona.

Yavapai County

DOLPHIN(Crown King)—Messrs. Braun & Blichenstaff, working under lease, will soon be milling ores in their plant at Saratoga mine.

WAR EAGLE (Crown King)—In breast of War Eagle-Gladiator tunnel, 5 ft. solid sulphide encountered. Property controlled by Detroit capital.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Eighty-stamp mill running full capacity on ore from 3000- and 3100-ft. levels.

PLYMOUTH CONSOLIDATED (Plymouth)—First cleanup reported encouraging. New 20-stamp mill said to be handling 300 tons per day owing to improved processes.

Butte County

WILLIAM BIEK (Forbestown)—Mine being put in shape to resume operations coming winter. Equipped with 5-stamp mill.

OROVILLE UNION GOLD DREDGING CO. (Oroville)—Company incorporated by J. G. Nisbet, W. H. James, S. W. Cheyney, W. C. Putnam of Oroville and John Bradbury of San Francisco, to operate on recently purchased properties.

Calaveras County

DUCHESS (Vallecito)—Cyanide plant being erected. Active development work in progress.

BOWLING GREEN (Vallecito)—New mill for washing gravel erected. New 60-ft. headframe and pipe line installed.

Eldorado County

ALDERSON (Placerville)—William Williams, miner, imprisoned by cave-in, rescued after 12 hours. Cave-in caused by rotting timbers in tunnel.

Kern County

HAYDEN HILL (Hayden Hill)—Crushing and cyanide plant being installed.

PLACER GOLD CO. (Randsburg)—Company intends increasing output by installing additional dredge machinery.

ANTAROSA (Caliente)—Strike reported. Installation of mill contemplated. High waters in past winter said to have disclosed large outcroppings. Property abandoned several years ago as being worthless.

Madera County

MADERA-ENTERPRISE (Grub Gulch)—Reported operations will be resumed, after 30-day shutdown.

Modoc County

HESS (Adin)—Reported company intends increasing milling capacity.

Placer County

BOBTAIL (Auburn)—Property bonded by William Recknagel who contemplates erection of 5-stamp mill, concentrator and new hoist. Shaft will be deepened.

PARAGON (Forest Hill)—J. F. Thompson has filed on water rights in Volcano Cañon to develop power for mine. Small dam to be erected and flume ¾ mile long.

BELL (Auburn)—Property bonded to W. G. Ruhl, of San Francisco. Active development work commenced to determine extent of orebody. Erection of mill contemplated.

Plumas County

BELLEVUE (La Porte)—Tailings in Wallace Creek being cleaned up. Development work suspended since outbreak of war, but expected to resume shortly.

San Benito County

ALPINE (Hernandez)—This quicksilver mine will resume operations. Retorts have capacity of 40 flasks per month.

San Bernardino County

DAMAGE SUIT instituted by Henry E. Lee against California Trona Co., American Trona Co., and a detective agency, aftermath of Searles Lake potash war. Lee charges false imprisonment and malicious prosecution.

AMERICAN TRONA (Searles Lake)—Railroad connecting potash fields and Southern Pacific railway completed for general traffic. Road 30 miles long, gives outlet for company's products and provides transportation for machinery for increasing plant.

BONANZA KING—Suit instituted by Charles E. Usher and W. K. Krips, representing Bonanza King Development Co., against Trojan Mining Co., to quiet title to Rattler, Eudora, Maud, Gypsy, Donald, Amboy, Cincinnati and other mines in Trojan district. Trojan company defunct.

Santa Clara County

PHOENIX (San Jose)—Quicksilver property reopened after long shut-down.

Shasta County

BALAKLALA (Coram)—Stated this First National mine may erect sulphuric-acid plant. Has $275,000 cash and bills receivable sufficient for purpose. Stated reserves are 3,000,000 tons 2.85% copper ore carrying $1.20 in silver. Standard Oil, General Chemical and Hercules Powder companies among others along coast use sulphuric acid. Standard Oil makes acid from sulphide ores bought from Mountain Copper.

Sierra County

SIERRA CONSOLIDATED GOLD MINING CO. (Camptonville)—Company organized to work property on Mountain House ridge. Incorporators are V. Grey, W. H. Stokes and M. Stokes, of Stockton, and A. B. Hennessy, of San Francisco.

BALD MOUNTAIN (Downieville)—Surveys completed, plans drawn for buildings, machinery in transit, preparatory to developing quartz ledge discovered during working of gravel channel on this property. Development under charge of William Copeland who, with associates, holds property under bond.

OXFORD (Downieville)—Quartz group, owned by Diwnieville people, passed under bond to Grant Snyder and associates of Salt Lake City, who will develop on large scale. Gold Bluff group, adjoining, expected to be handled in conjunction, lower tunnel to be used in working Oxford ground, all ore to be reduced in the Gold Bluff plant. Oxford vein lies close to serpentine contact, believed rich. Extensive sampling under way, in charge of Sol Camp.

Trinity County

PAULSEN RANCH, near Lewiston, is being prospected for dredging ground.

BELLEVUE (Hayfork)—Five-stamp mill being installed.

NEVER SWEAT (Lewiston)—Sam and Ed Sorenson have purchased this property.

TRINITY ASBESTOS (Carrville)—Installation of machinery nearly completed. Product will be quarried; is reported to be of fine quality. Plant will have initial capacity of 50 tons per day. Shipments expected to commence in October. Options taken on extensive area of adjacent ground, which will be thoroughly prospected.

Tuolumne County

SANTA YSABEL (Stent)—Unwatering completed and examination proceeding.

PROVIDENCE (Tuolumne)—Strike reported. Ledge uncovered while clearing débris at 700-ft. level. Samples show tellurium and free gold.

OLD DOMINION (Columbia)—Suit instituted by Thomas P. Bacon against George F. and Adel Lewis Grant, owners of property. Plaintiff alleges fraudulent representations regarding property.

COLORADO

Ouray County

COLUMBUS (Ouray)—Dividend Gold Mines Co. title of new operator developing orebody said to be 5 to 30 ft. thick with good gold content.

San Juan County

HAMLET (Middleton)—James O'Kelly, superintendent, after year's steady development, has put property into condition for starting up mill.

KITTIMAC (Middleton)—Force of men under Frank Card completely remodeling mill while another force is repairing aërial tramway and getting mine in shape. Electric undeground haulage will be installed.

San Miguel County

CARRIBEAU (Ophir)—Property will be reopened and operated throughout winter by Ralph Hansen.

SMUGGLER-UNION (Pandora)—Force of men employed sorting ore from mine dumps in Marshall Basin and drawing old stopes in Mendota mine. This material treated in mill and cyanide plant at Pandora.

Teller County

ACACIA GOLD MINING CO. (Cripple Creek)—Sinking of South Burns shaft resumed.

JERRY JOHNSON GOLD MINING CO. (Cripple Creek)—Erection of 50-ton mill for treatment of low-grade ores under consideration.

EL ORO MINING & MILLING (Victor)—On 500-ft. level of Eclipse shaft, large orebody opened on Mullen vein. Shoot exposed for 100 ft. and is 30 ft. wide. Ore runs $12.

GEORGIA

Lumpkin County

TOLEDO MINING CO. (Dahlonega)—Mill practically completed, linings of tube mill only feature lacking; are looked for daily.

CONSOLIDATED MINING CO. (Dahlonega)—New company has bought holdings and recently took possession. Water shortage still hampering mining operations.

IDAHO

Coeur d'Alenes

CHICAGO-BOSTON (Wallace)—After building water-power flume, installing compressor, erecting new buildings and making other improvements, company has resumed work under ground.

KEYSTONE MINES CORPORATION (St. Joe)—Spokane men have organized company to operate 21 claims in the Blacktail district, about 5 miles east of St. Joe. F. O. Berg, president; E. C. Tousley, secretary; M. L. Fox, treasurer. Properties taken over include those of Little Joe Mining Co. and those operated by late W. H. Brown. Mine has already been opened to depth of 700 ft. by tunnel and considerable high-grade ore shipped. Ore is silver, with some gold and copper. Stated much will be shipped direct to smelter and milling ore treated by contemplated concentrator at property. E. A. Ely, mining engineer and director in company, will direct work at property.

MICHIGAN

Iron

YALE (Bessemer)—Mine closed; 150 men affected. Is property of Lake Superior Iron & Chemical Co., only ore producer of that corporation.

DAVIDSON (Iron River)—Shipments for year suspended this week and all ore hoisted now will be placed in stock. All ore hoisted since navigation opened and large part of that in stock was sent out.

BALKAN (Alpha)—New shaft being sunk from surface over caved raise will not be completed for some time. In stripping, one of drag-line machines is working on second lift, and stripping is not so easy as on first cut, where only pure sand was encountered. As soon as pit is a little wider, other machine also will be sent to second cut.

OGLEBAY, NORTON (Iron River)—Company has secured option on most of land between the Ravenna mine and Fortune Lake, in Iron County, and started several churn drills. As soon as work of testing out ledge is completed, diamond drills will be employed. Ground under option comprises several hundred acres; believed chances of locating iron ore deposit are excellent.

ROGERS (Iron River)—Munro Mining Co. erecting 15 dwelling houses for accommodation of miners. Company recently gave picnic at Rogers mine for employees and families —most successful. Crowd of 1000 to 1500 people on grounds during day; at night well attended dance wound up festivities. Two special trains, one from Iron River and one from Chicagon mine, conveyed most of assemblage to park. George L. Woodworth, general manager, welcomed employees and delivered short address. Rogers mine brass band furnished music. Company distributed 50 gal. ice cream, 300 lb. of peanuts and barrels of lemonade. Sports included drill-rigging contest, shoveling contest, demonstration of first-aid work and fire extinguishing. Nursery and resting place for babies and mothers in three tents was in charge of company's visiting nurse. In drill-rigging contest, two Hiawatha mine employees won first prize in record time of 2 min. and 37 sec. Hiawatha mine also took first honors in shoveling contest, winner loading 2500 lb. of ore into car in 3 min. 7 sec. Long list of sports, for which company gave $150 in prizes, was run off. Baseball game between two teams of miners was another feature.

MINNESOTA

NEAR BARROWS, the Brainerd Mining Co. and Barrows-Mississippi Iron Co. are both operating drills. Nothing known of discoveries.

CUYUNA-MILLE LACS (Ironton)—New air compressor of larger dimensions just installed.

BARROWS MINING CO. (Barrows)—Drills on this property all moved to another quarter. First hole showed 200 ft. of ore.

KENNEDY (Cuyuna)—Arrangements completed whereby future shipments will be divided between Soo and Northern Pacific. Heretofore all tonnage went via Soo Line.

ADAMS (Oreland)—Through series of mishaps to both steam and electrical pumping equipment, mine permitted to fill with water; 2000-gal. baller installed to unwater.

CUYUNA MILLE LACS (Brainerd)—Mine rushed with orders for manganese ore, as is Cuyuna-Duluth, both owned by American Manganese Mfg. Co. Ore shipped East as fast as mined.

PENNINGTON (Ironton)—After having been put into shape to ship and kept thus for several months, this open-pit has now been closed for winter without having shipped this season.

WILCOX (Woodrow)—Shaft down 190 ft.; drifting will be started at 200 ft. All mine buildings completed and foundation now being made for hoist. Ore will soon be hoisted as deposit is close to shaft.

CUYUNA-SULTANA (Crosby)—Drilling on the Campbell forty about completed; thirty acres of 40 known to be underlaid with ore. Second exploratory shaft will soon be sunk. Company also meeting with success drilling on Almar property on Vermilion range.

JONES & LAUGHLIN (Crosby)—Company given option for lease of strip on south side of Sultana property, to be used as slope for openpit operations. Jones & Laughlin will probably take over and strip Cuyuna Iron & Manganese ground.

IRON MOUNTAIN MINING CO. (Iron Mountain)—Company sold stockpile of several thousand tons manganiferous iron material to company installing the John T. Jones furnace near Marquette, Mich. This furnace, adaptation of step-process furnace, intended to simplify reduction of high manganese, low-iron ores such as abound on Cuyuna range.

CROFT (Crosby)—Mine buildings about completed, also concrete chimney, tallest in Cuyuna district. Sinking on working shaft about to begin. Shaft will be concrete, circular about 18 ft. in diameter, with 3-ft. walls. Tonnage will be handled by the N. P., which is working on trackage connections now. This shaft will open up only known deposit of bessemer ore on Cuyuna range.

Mesabi Range

BENNETT (Keewatin)—Mine closed Sept. 16 for season.

MISSISSIPPI (Keewatin)—Mine reopened Sept. 15, employing about 30 men.

SILVER (Virginia)—After shipping about 200,000 tons, mine closed for season, throwing 150 men out of work.

DEAN (Buhl)—This openpit owned by Great Northern Ore Co. and now being stripped, leased to Tod, Stambaugh & Co. who will operate next season.

ALLEN (Virginia)—Mine to be closed down Oct. 1. Only small force employed for two years past, output for two years being 75,000 tons. Shaft house will be dismantled; understood ore suply is exhausted. Morris Mining Co. was operator.

REPUBLIC IRON & STEEL (Duluth)—F. J. Webb, general manager in the Lake Superior district, reported as stating he would not be surprised if all of company's mines on Mesabi closed within 30 days. Only thing to prevent such action will be receipt of unexpected orders for ore. Said demand for iron and steel had been lighter than usual of late and considerable ore was stored in East and at mines. However, good times are looked for next year in iron business.

MONTANA

Cascade County

FLORENCE (Neihart)—Property sold by sheriff to Carl Schenk, Great Falls, as result of action by Mr. Schenk to foreclose. Schenk had secured 23 labor liens against property, and paid $4293 for title.

Madison County

FLORIDA-GIANT MINE (Bear Gulch)—New 480-ton cyanide plant rapidly nearing completion. Developed tonnage roughly estimated at several hundred thousand, running from $8 to $12. Senator Foraker and son of Ohio are interested in company.

Silver Bow County

THREE MEN KILLED by cave in prospect shaft at Maiden Rock near Butte. Slide came from surface around collar of shaft. Men buried 14 ft., were dead when rescuers reached them; bodies found standing. One victim, Henry Rodda, well known as blind miner.

BUTTE & SUPERIOR (Butte)—According to August report, 28,912 tons of ore treated by flotation, resulting in recovery of 6424 tons of concentrates at cost of $4.223 per ton. Concentrates valued at $31.028 per ton; increase in percentage of extraction was accompanied by increase in cost of treatment, which in July was $3.083.

BULLWHACKER (Butte)—At special meeting of stockholders in Butte, Sept. 21, motion was adopted favoring plan for reorganization that involves assessment of 15c. per share to pay off $125,000 indebtedness and provide about $20,000 needed to complete mill and resume operations. Resolution was preceded by sensational attack upon "Patsy" Clark and present management by Samuel Alexander representing a number of minority stockholders. Said Clark had run company in debt to get control for himself. In reply Mr. Clark submitted audit covering company's affairs since 1906 and containing vouchers and canceled checks for every cent paid out. Also made proposition that new company be organized under laws of Montana to take over Bullwhacker property. Majority of stockholders present thought that only thing to do was to go ahead as suggested by Mr. Clark for reorganization of the company and completion of mill.

ANACONDA (Butte)—Experiments being carried on at mines of company with new explosive "Sabulite" under direction of company officers and of Mr. Davis, representing manufacturers. Sabulite, patented in Belgium, claimed to be explosive of great strength, perfect safety in manufacture, transportation and handling, insensible to shock, friction, fire or frost and with fumes absolutely harmless. Only about one-third of amount usually employed in dynamite is required to get same effect. On Sept. 18 demonstration was made at Original mine but result was unsatisfactory, owing to fact, according to Mr. Davis, that expert from factory got his weights mixed. Second test was made at Anaconda mine Sept. 22 with satisfactory results. Round of nine holes was loaded with powder, about 75% of usual amount of dynamite; effect was acknowledged better. Those watching experiment walked back to breast immediately after blast and found that although air was filled with smoke, it had no fumes nor choking effect. Assistant general manager Dunshee of Anaconda, who witnessed test, stated that to all appearances explosive was all claimed for it, probable further experimenting will be carried on. [A Belgian powder was tried in California mine three years ago. Each stick in two parts, one hollow and other slipped in. Neither could be set off alone. Great safety claimed. Foreman John Hogan said it worked like seidlitz powder but was mistaken; didn't work at all. This probably no fault of powder, however. At underground trial in granite, Belgian expert scorned assistance of native-son miner in loading. Charge didn't crack rock. Powder rejected by mine management.—Editor.]

NEVADA

Elko County

FLAXIE (Jarbidge)—Stated milling plant decided on. Water right on Bear Creek acquired and will be developed to run mill. Estimated 55 hp. can be developed in season of low water under head of 1280 ft.

Esmeralda County

PITTSBURGH-SILVER PEAK (Blair) — Blacksmith shop destroyed by fire Sept. 12. Fire discovered when night crew came off shift. Shop total loss, but machine shop adjoining and rest of surface plant saved, due to sufficient water supply and efficient fire-fighting apparatus. Leyner drill sharpener may be repaired.

Eureka County

CYANIDE MINE (Eureka)—Work will be resumed Oct. 1, on this and other silver properties on Adams Hill.

Humboldt County

ROCHESTER CONSOLIDATED (Rochester) — In railroad construction work, unique locomotive, consisting of a 60-hp. automobile engine on light railroad trucks, is used and gives satisfaction, while its operating cost is low.

Lincoln County

VIRGINIA LOUISE (Pioche)—Deal for sale of controlling interest to Prince Consolidated Mining Co. closed and money paid.

DAY-BRISTOL (Pioche)—Application for sale of property to clear indebtedness held in abeyance until Oct. 14. Fred W. Frost, attorney for company, states steps have been taken to finance property and pay indebtedness, which is $90,000.

Mineral County

LUNING GOLD MINES CO. (Luning)—Reports current that property has been leased to Sacramento mining men and active operations will begin early next month.

WAGNER AZURITE (Luning)—Leaching plant so far not successful in filtering solution. Now intended to try pressure instead of vacuum. If this fails, decanting will be resumed. Large bodies good-grade ore exposed, sulphides coming in, which will necessitate roasting.

COPPER QUEEN (Luning)—Option taken up by C. B. James and associates; force of men will be put to work at once in further opening up showings on St. Patrick and Erma group. This property consists of 44 claims north of Luning, adjoining Geroux property on north and Luning-Idaho property on south. Development to date has exposed copper ore, with silver running well. Property has been large producer.

Nye County

TONOPAH MINING CO. vs. TONOPAH EXTENSION SUIT—Tonopah Mining has made application to district court for orders restraining Extension from removing ore from Sandgrass claim of former. Suit is for recovery of $200,000, value of 12,000 tons ore alleged extracted from plaintiff's territory during last seven months.

BIG PINE (Manhattan)—Crushing system for handling ore from glory hole successful. Blake crusher at shaft collar crushes ore hoisted from 200-ft. level. Oversize from grizzly trammed to waste dump does not run over 60c. per ton. This oversize is about one-half of ore hoisted so that separation is highly economical. Tests being made on feasibility of eliminating stamps and feeding from crusher to tube mill.

TONOPAH MINING CO. (Tonopah)—Company announces to stockholders that it has option on property of Panama Mining Co. in Nicaragua until Feb. 1, 1915. If exercised, new company controlled by Tonopah Mining will be organized, 40% of stock being turned over to Panama company. Tonopah buys property, not stock. Probably no decision will be made until full time of option expires.

Washoe County

THE NEVADA ENGINEERING WORKS at Reno had its entire plant except foundry destroyed by fire of unknown origin, Sept. 16. Loss to company estimated $50,000, partially covered by insurance; total loss, including railroad rolling stock, etc., $75,000. Arrangements made with N. C. O. R.R. to use their shops at night and as much in day time as possible. Stated construction of new plant will commence at once and will be in operation within 60 days.

NEW MEXICO

Grant County

APRIL FOOL MINING CO. (Fierro)—Work suspended owing to misunderstanding among stockholders.

EMPIRE ZINC (Hanover)—Tramway from Nason tunnel to Santa Fé railroad practically completed. Ore bins being erected at loading point. Operations may soon commence on sulphide claims east of present workings.

Santa Fé County

AMERICAN GOLD, COPPER MINING & SMELTING CO. (Santa Fé)—Property failed to bring bidders at receiver's sale in Santa Fé. Will be offered again, Oct. 15. Consists of five developed claims and 160 acres patented mining land in Cerrillos mining district. Ore is low grade.

Sierra County

ANDREWS MINES (Hillesboro)—Property sold to Messrs. Moore and Van Deeman and Mrs. Connor. Will be put in workable condition. Reported new machinery will be installed in El Oro mill.

Socorro County

LARGE MINING COMPANIES OF MOGOLLON have issued call for more miners. All operators working full time.

PRECIOUS METALS EXPLORATION CO. (Mogollon)—Winze started in No. 3 1200-ft. tunnel to penetrate No. 1 orebody of milling ore. Contract for milling made with Deadwood Co. E. M. Carter in charge.

Taos County

CHAMPION COPPER CO. (Embudo)—Company expects to begin operations soon. Will sink 500-ft. shaft. Showing of copper oxides on claims located 20 miles south of Taos.

NEW YORK

St. Lawrence County

TALC BUSINESS somewhat stimulated by war, on account of increased demand from paper mills, and because of the slackening in importation of foreign clays and talc. International Pulp Co., largest talc company, recently had unusual run of water in its No. 2½ mine at Talcville, so that at present mine is full of water from bottom, at 600 ft. depth, to about 300 ft., and water is still coming in. Although workings are close to Oswegatchie River, it is not thought water comes from there; Freeman mine adjoining has not yet been affected. Uniform Fibrous Talc Co. at Talcville and St. Lawrence Talc Co. at Natural Bridge, have recently increased capacities for mining and milling.

NORTHERN ORE CO. (Edwards)—Company preparing specifications for new concentrating mill to replace one burned several months ago. Will be tile and concrete construction, fire-proof. Burned machinery cleared from mill site, and some repaired to be used again. Regretted that month more of experimental work was not possible in old mill, to put finishing touches on special process evolved for separating blende from pyrite. Mine development continues in Brown, White and Williams shafts; depths of 450 ft. on the incline of 30° to 60° attained. Connections made underground between Williams and White shafts, and former will become permanent hoisting shaft, being on top of hill, which will

serve to give gravity drop to mill. With depth ore persists in quality and quantity; pyrite not seeming to increase. Other zinc lands being explored in district, and several promising properties known to exist.

OREGON

ARTICLES OF INCORPORATION of Gleeson Development Co., mining concern capitalized at $75,000, filed with Corporation Commissioner by Walter A. Gleeson, Fred M. Coleman and E. M. Wright all of Portland.

THE FIRST GOLD DUST TO ENTER PORTLAND from Alaska since 1899 came in recently on the "J. B. Stetson." Purser Crichton's safe held $39,000 worth owned by James W. McClosky, of Juneau. Stetson is one of fleet being operated by Portland people in effort to get back Alaska trade.

Baker County

RESTRAINING ORDER GRANTED in case of R. C. Crawford vs. Susie Norwood et al., in which defendants are enjoined from occupying or developing certain mining claims in Virtue district, title of which was involved in suit. Miss Norwood and Mrs. Grace Carmait have been working the claims for over a year.

COLUMBIA GOLD MINING COMPANY (Sumpter)—Company has large stock of cyanide on hand. Price in this section is now 75c per lb.; ordinarily is 19c.

Curry County

LOYAL GOLD MINING & MILLING—Company in market for new equipment for installation at mine near Gold Beach; includes three boilers, four steam engines, four gasoline engines, two centrifugal pumps and other apparatus. J. R. Peters in charge.

Jackson County

BRADEN MINE (Gold Hill)—Mine recently closed down owing to the European war, throwing 40 men out of work, is to resume operations.

Josephine County

COPPER QUEEN (Leland)—Property three miles from Leland actively developed and 20-ton cyanide plant now about completed. Manager L. W. Bench, of Grants Pass, states that company has good supply of cyanide ordered and does not expect to shut down during war.

GOLD RIDGE CONSOLIDATED (Holland)—J. S. Windell, representing company, has gone out to property recently purchased on Illinois River to start extensive development work. Property includes some of best placer ground in section. Mine was producer for number of years; there is still large acreage of unworked ground.

OREGON GOLD MINES COMPANY (Granite Hill)—Company which is reorganization of Oregon Gold Fields Co., of Chicago, under the management of Messrs. O'Grady and Setchell is nearing producing stage. Workings are being unwatered and machinery put in shape to run; stamp mill is in operation for test run. New vein discovered and is being milled while deep workings are being retimbered.

PENNSYLVANIA

FRENCH CREEK IRON MINES reopened and modern methods will be applied. [Newspapers have reported some ore running 90% iron and all running better than 75%. Some iron and some newspapers!—Editor.]

NEW JERSEY ZINC reported to have purchased additional property at Friedensville, Penn., for zinc prospecting. Near old zinc mine flourishing 1872-1888. Company now owns 600 acres; shipping in drills; will provide work for 300 men.

AMERICAN MANGANESE MANUFACTURING CO. (Dunbar)—Reported company would start plant Sept. 28, to manufacture "ferro" out of Cuyuna ore, of which 200 cars are said to be on way. Product will be low grade, 30% to 40% Mn as against 80% of imported. Ores not suitable for high-grade alloy.

TENNESSEE

LEONARD CONSTRUCTION (Embreeville)—Operations for zinc begun. Reported concentrating and smelting plant to be installed.

UTAH

Beaver County

NOONDAY (Milford)—Drifting on 200 level, present bottom of shaft, has encountered iron with some lead.

MOSCOW (Milford)—Seven teams hauling ore and shipments of 15 to 20 cars monthly being made. Output to be increased.

UTAH MINING, MILLING & TRANSPORTATION (Milford)—Two feet of ore running well in silver opened on 400 level of Lady Bryan property, half a mile from the Moscow. Usual ore from this property carries silver with large excess of iron.

Juab County

TINTIC SHIPMENTS for week ended Sept. 18, show substantial gain, being 119 cars compared to 86 for week preceding. Eighteen properties made shipments, among which were Opohongo and Grand Central, which for several weeks have been absent from list. Eagle & Blue Bell shipped, though shaft sinking is in progress. Heavier shipments made by Lower Mammoth.

CENTENNIAL-EUREKA (Eureka)—Latest available reports of accident state one man rescued, two bodies taken out, three more discovered. Remaining six men supposed dead.

LOWER MAMMOTH (Mammoth)—Work on zinc ore being done between 1000- and 1100-ft. levels. There are large deposits of zinc ore too low-grade for direct shipment, for which no suitable treatment has yet been found. Lead, copper and zinc ores being shiped.

AMERICAN STAR (Eureka)—Company owns claims—formerly the Town View ground—adjoining Chief Consolidated on southeast. Drifting being done from Eagle & Blue Bell to reach property. About half of necessary 400 ft. of work covered. Imer Pett is president.

Summit County

PARK CITY SHIPMENTS for the week ended Sept. 18 amounted to 1,856,720 lb., by five shippers. Considerable satisfaction felt in the camp at resumption of operations by Daly-Judge.

DALY-JUDGE (Park City)—Development work going on, and hauling of concentrates started. Practically full force of 250 men working.

SILVER KING CONSOLIDATED (Park City)—Through error in Park City shipments for week ended Sept. 18, company's output was given as 110,200 lb. instead of 634,000 lb. From 40 to 60 tons first-class ore being mined and shipped daily.

DALY (Park City)—Arrangements made with Mines Operating Co. for testing low-grade ore. Low-grade silver ores of Daly are similar to Ontario stope fillings, being treated successfully at Mines Operating Co.'s mill. Thought much of Daly stope fillings can be treated.

SILVER KING COALITION (Park City)—Work being done on 200 level of new shaft at Silver Hill station. There is a good showing and more men will be worked here as soon as possible. Preparations being made to sink central shaft below 1300 level. When 1600 level is reached drifting will be done for extension of known orebodies.

THOMPSON-QUINCY (Park City)—Operations resumed Sept. 23. Shipment of ore already broken in the mine will soon be made. Air, etc., is obtained from Daly West, and when this company's mill and power connections are completed work at Thompson-Quincy will be facilitated. Milling ore broken or in sight may be treated at Daly West mill.

VIRGINIA

VIRGINIA SMELTING CO. (Norfolk)—Plant being operated by Norfolk Smelting Co. Inc., in which it is understood Beer, Sondheimer & Co. is interested. Blast furnace started Sept. 14, after being shut down two months; 150 men are employed. Dwight-Lloyd sintering machine has been working some time on zinc-retort residues, pyrite residues from acid works and fine Cuban copper ore. Puts out from 75 to 100 tons daily, product being smelted with other copper ore in blast furnace; 300 tons in all is smelted daily, with output of about 60 tons of matte. Copper leaching plant being erected to recover copper from acid works residues, which will afterward be sintered and used in iron blast-furnaces. Two bessemer converters and additional Dwight-Lloyd machine to be added to smelting plant; modern sampling mill to be built.

CANADA

Manitoba

NEW STRIKES AT GOLD LAKE in Rice Lake district have induced another rush of prospectors. First production brought to Winnipeg, gold brick worth $260 from treatment of 1½ tons of ore. Stated this represents only 60% of gold content of ore, remainder being on plates of mill and awaiting cyanide treatment. Property is owned by Independence Mining Co., which is arranging to install five-stamp mill complete with concentrator and cyanide plant. In meantime will ship high-grade ore to Montana for milling.

Ontario

DOMINION STEEL has deferred dividend on preferred shares.

NOVA SCOTIA STEEL COMPANY has received large order for steel shells from government.

LAKE SUPERIOR CORPORATION has decided not to pay interest on the income bonds which falls due Oct. 1. Directors state that while business has been maintained and earnings compare favorably with those of previous year, outlook is decidedly uncertain.

SCHUMACHER (Porcupine)—Practically all miners discharged.

CANADIAN EXPLORATION (Sudbury)—Now producing gold bullion to value of approximately $22,000 per month.

COBALT LAKE, it is officially stated, will be lowered about 6½ ft. this year but will not be pumped out until spring.

HOLLINGER (Porcupine)—First unit of new power plant in commission. Practically all development on Acme stopped as there is sufficient ore developed for proposed 20 stamps.

JUPITER (Porcupine)—Option to McKinley-Darragh extended until October to permit of sinking to 500-ft. level. Development at 400 ft. not so satisfactory as expected.

VIPOND (Porcupine)—Financial reorganization plan adopted last May has fallen through, but property was financed and put on operating basis on guarantee by Henry H. Ward, president of the company.

MEXICO

General Conditions

R. M. RAYMOND, managing director of Exploration Co., Ltd., of London, reported, while in San Francisco recently, that El Oro Mining & Railway was preparing to resume operations on an extensive scale. Supplies of cyanide ordered months ago arrived in Mexico while operations were suspended, and consequently company now has sufficient for long period. Understood some of other important mining concerns of Mexico are similarly fortunate in respect to cyanide. Santa Rosa Mining & Milling Co., of state of Zacatecas, controlled by Exploration Co., will not resume operations at once. Reports from state of Chihuahua are that mining, milling and smelting operations are at present handicapped by labor scarcity. Recent recruiting for army of Gen. Villa extensively affected the labor supply, already depleted, but is expected that as result of curtailment of operations at copper camps in United States many Mexican laborers will return to northern Mexico. Chihuahua plant of A. S. & R. operating two furnaces. In Jalisco, Amparo and Cinco Minas companies doing some work, and work probably will be resumed soon at El Favor, Mololoa, Casados and Espada properties. Much work will be soon in progress in Pachuca and Guanajuato districts.

The Market Report

METAL MARKETS

NEW YORK—Sept. 30

Dullness and pessimism have been the characteristics of the markets for copper, lead and zinc. In tin there has been a little more doing.

Copper, Tin, Lead and Zinc

Copper—It is feared that the closure of the Dutch outlet for copper will necessitate a further restriction of production if the existing situation is to be preserved. During the last week domestic manufacturers have wanted to order but very little copper. On the other hand the producers have continued to refrain from making any real effort to sell. Nobody knows what the market would be if any opportunity of disposing of a big quantity of copper should present itself. Some scattered transactions are reported at 11¼@12c., regular terms. At the end of the week it is said that copper is to be had at 11¾c., delivered in Connecticut, less ½% commission.

Base price of copper sheets is 17½c. per lb. for hot rolled and 18½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 13¾@14c. per lb. for carload lots at mill.

Exports of copper from New York for the week were 2151 long tons. Our special correspondent gives the exports from Baltimore at 1346 tons copper.

Tin—Business in future deliveries was done this week. Some spot tin was pressed for sale but not much business was done.

Lead—On Sept. 24 the A. S. & R. Co. reduced its price to 3.75c., New York, thus coming more nearly into step with the open market at St. Louis, which had previously stood at a price whereof the New York parity was 3.80c. The cut may have been for the purpose of curtailing ore production, many of the mining companies having failed to read the signs of the times. Anyway it has apparently been futile in stimulating a buying movement, the market having been conspicuously dull right through the week and during the last few days there has been further shading of prices by independents. A little domestic lead is reported sold for export.

Spelter—Certain producers having stolen a march on their competitors and disposed of a round tonnage at 5c., about all came down to that figure, but found that the demand had been filled and that it would be necessary to go lower to arouse further interest. At 4⅞c. a moderate business was done on Monday and Tuesday. On Wednesday spelter was offered at 4.80@4.85c. This is getting down to about the present parity of London, where spelter is offered at £24, which one exporting house reckoned as equivalent to about 4.80c., St. Louis. No export business in prime western spelter was done during the week, but there was a continued demand for high-grade spelter, 99½% Zn and upward, and some sales of that sort were made.

DAILY PRICES OF METALS

NEW YORK

Aug. Sept.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
24	4.9525	53	*	31¼	3.75	3.60	5.05 @5.15	4.90 @5.00
25	4.9635	53	*	31	3.75	3.60	5.05 @5.15	4.90 @5.00
26	4.9725	53¼	*	31	3.75 3.70	3.60 3.55	5.00 @5.10 5.00	4.85 @4.95 4.85
28	4.9900	52¾	*	30¾	@3.75 3.70	@3.60 3.55	@5.05 5.00	@4.90 4.85
29	4.9925	53¾	*	30¾	@3.75 3.70	@3.60 3.55	@5.05 4.95	@4.90 4.80
30	4.9775	52¾	*	30¾	@3.75	@3.60	@5.00	@4.85

*No quotations.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

Other Metals

Aluminum—The market remains quiet and rather dull. Quotations are rather nominal and lower, 18.50@19c. per lb. being named for No. 1 ingots, New York.

Antimony—The market remains dull, with small sales, and prices are rather nominal. Ordinary brands—Chinese, Hungarian, etc.—are quoted at 8½@9½c. per lb. For Cookson's, 10½@11c. is asked. For other special brands there is no sale. There are fair stocks on hand at present, but no supplies are coming in except a little from China.

Quicksilver—The market is quieter than it was. Prices are easier, but are firm at the lower quotation, which is $65 per flask of 75 lb., New York. High prices are expected as long as the war continues. The demand is very large and supplies are cut off to some extent.

Minor Metals—Quotations for **Bismuth** are $2.85@3 per lb. —**Magnesium**, $1.50 per lb., New York.—**Selenium**, $3@3.25 per lb. for lots of 100 lb. or over, $5 per lb. for small quantities.

Nickel—Shot, blocks or plaquettes are 40@45c. per lb. Electrolytic is 5c. per lb. higher.

Foreign Trade of Great Britain in Metals other than iron and steel six months ended June 30, in long tons:

Metals:	Imports 1913	Imports 1914	Exports 1913	Exports 1914
Copper	68,023	85,321	35,677	32,782
Tin	23,417	24,013	22,051	22,244
Lead	104,779	110,104	31,846	29,227
Zinc	73,049	65,266	4,758	5,673
Quicksilver	1,334	1,178	591	401
Minor metals	4,300	4,822	14,745	13,732
Ores, etc.				
Tin ore and concentrates	17,262	19,799	.....	.....
Pyrites	423,187	419,493	.....	.....

Copper includes contents of ore and matte imported. Exports include reëxports of foreign material.

German Foreign Trade in Ores half-year ended June 30, in metric tons:

	Imports 1913	Imports 1914	Exports 1913	Exports 1914
Gold and silver	987	781	1	1
Copper	14,022	15,363	14,400	7,122
Tin	9,170	9,219	.....	.....
Lead	70,087	83,818	2,437	2,414
Zinc	157,457	153,866	18,040	22,826
Nickel	6,643	13,042	.....	.....
Wolfram	2,495	2,535	140	192
Chrome ore	7,731	6,327	284	1,292
Pyrites	508,957	570,805	16,966	13,762

Imports of slags and slag products were 655,245 tons in in 1913 and 558,872 in 1914. Exports were 86,395 tons in 1913 and 95,620 tons this year.

German Foreign Trade in Metals other than iron and steel is reported as follows for the half-year ended June 30, in metric tons:

	Imports 1913	Imports 1914	Exports 1913	Exports 1914
Copper	127,700	130,898	53,200	54,954
Tin	7,084	7,302	5,255	5,241
Lead	41,573	29,091	32,954	26,707
Zinc	28,213	25,950	61,798	62,749
Nickel	1,189	1,066	1,018	1,445
Aluminum	6,574	7,074	6,584	4,520
Miscellaneous	958	1,376	10,557	10,925

Miscellaneous includes the minor metals and alloys. The exports include alloys and manufactures of the various metals.

Gold, Silver and Platinum

Gold—Arrangements are nearly completed for the pool of $100,000,000 gold to be raised by the banks, chiefly for the purpose of regulating exchange.

Imports of gold in Great Britain eight months ended Aug. 31 were £47,631,335; exports, £29,325,256; exeess of Imports, £18,306,079, against £15,566,485 last year.

Platinum—There is no excitement in the market, though no inerease of supplies is in sight, and the future is uneertain. Dealers still hold at about $50 per oz. for refined platinum and $57.50 for hard metal.

The latest report received from our Russian correspondent says that the market is dull and inactive. No demand can be noted either from abroad or on the internal markets. Russian export trade owing to politieal events is in eourse of stopping. Work in the platinum mines is sensibly shortened, as many miners are called out to the army. The prices are only nominal, no business being reported. The quotation at Ekaterinburg is 9.50 rubles per zolotnik—equal to $35.72 per oz.—for crude metal, 83% platinum; in St. Petersburg, no quotations.

Silver—The market is dull, at present. The English mint is the only buyer. No outside business is possible. Continental demand is expected when exports can be made.

London quotations for silver were on Sept. 24, 24¼d.; Sept. 25, 24¼d.; Sept. 26, 24¼d.; Sept. 28, 24d.; Sept. 29, 24¼d.; Sept. 30, 24d., per oz. sterlinz.

Exports of silver from London to the East, Jan. 1 to Sept. 17, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India	£5,148,500	£4,466,000	D. £682,500
China	592,000	42,000	D. 550,000
Total	£5,740,500	£4,508,000	D. £1,232,500

Sinee July 30, this year, shipments to India have been only £114,500; to China, none.

Imports of silver into Great Britain eight months ended Aug. 31 were valued at £7,709,287; exports, £8,972,798; excess of exports, £736,489.

Gold and Silver Movement in the United States eight months ended Aug. 31, as reported by the Bureau of Commeree:

	Gold		Silver	
	1913	1914	1913	1914
Exports	$73,583,242	$135,769,576	$43,166,040	$33,090,463
Imports	41,572,860	37,169,961	24,331,964	15,992,663
Excess, exports	$32,010,382	$98,599,615	$18,834,076	$17,097,800

Imports of gold in August were $3,034,824; exports, $18,125,617; leaving $15,090,793 as the excess of exports.

Zinc and Lead Ore Markets

JOPLIN, MO.—Sept. 26

The high price of blende is $44, the assay base $39@42; metal base, $39@40 per ton of 60% zinc; calamine base, $23@24 per ton of 40% zinc; average all grades of zinc, $39.62 per ton. The high price of lead is $48.20, the base $46 per ton of 80% metal content; the average of all grades is $46.62 per ton.

SHIPMENTS WEEK ENDED SEPT. 26

	Blende	Calamine	Lead	Value
Totals this week	10,774,680	628,780	1,673,290	$264,710
Totals this year	391,505,780	28,972,600	67,314,740	$9,711,970

Blende value, the week, $217,620; nine months, $7,778,410.

Calamine value, the week, $8080; nine months, $338,080.

Lead value, the week, $39,010; nine months, $1,595,480.

Letter of Sept. 19, delayed in trasmission, shows priees of blende $47 high, $41@44 assay base, $40@41 metal base; calamine, $25@26; average all grades zine ore, $42.20; lead ore, $46.40; base, $46. Average all ores, $45.90. Shipments, 9,052,790 lb. blende, 362,630 lb. ealamine, 1,962,210 lb. lead ore. ore.

PLATTEVILLE, WIS.—Sept. 26

The base price paid this week for 60% zinc ore was $40@42 per ton. The base price paid for 80% lead ore was $44 per ton.

SHIPMENTS WEEK ENDED SEPT. 26

	Zinc Ore, Lb.	Lead Ore, Lb.	Sulphur Ore, Lb.
Week	3,399,570	60,000	157,860
Year	117,051,760	3,922,500	25,652,630

Shipped during week to separating plants, 4,058,530 lb. zinc ore.

Letter of Sept. 19, delayed in transmission, shows price of zinc ore, $42@43; lead ore, $44@45 per ton. Shipments, 3,502,610 lb. zinc ore and 254,060 lb. sulphur ore. Deliveries to separating plants, 2,953,550 lb. zine ore.

IRON TRADE REVIEW

NEW YORK—Sept. 30

The month ends with little change in the markets. Business is largely at a standstill as far as new orders are eoncerned, and specifieations on contraets are not increasing.

The reasons are found chiefly in the financial position, whieh remains unsatisfactory. Foreign orders come slowly, and nothing definite has yet been done about the large English inquiries for billets and sheet bars. Some sales of wire and of wire rods are noted.

PITTSBURGH—Sept. 29

The domestic market has grown still quieter, but the export market has undergone some improvement. The export branch of the Steel Corporation last week entered definite orders for 48,000 tons of steel, and although much of this was business closed some time ago, only final details being left to be arranged, the showing is a very satisfactory one, representing more tonnage than the average rate just before the war. Canadian business was especially prominent, while South American business made a very good showing.

Actual bookings of shipping orders in the steel trade do not promise to average more than about 30% of eapacity during the next week or two, while shipments are at about 50% of capaeity and are likely to deerease, there being little aeeumulation of business on books. In some products specifications are heavier at the moment than a fortnight ago, or than they are likely to be in the next two weeks, because they are filed against contraets expiring with this month, at lower priees than in contraets these buyers have for fourth quarter. In many eases, however, buyers have eontraets for fourth quarter at as low levels as for third quarter. The wire mills have advised holders of eontracts based on $1.50 for nails that Sept. 30 is the last day on whieh they can specify. Most of these contracts had already been closed out, and the trade will now be on the basis of $1.55 contraets. The openly quoted market is $1.60, but hardly any business is done exeept on old contracts.

Plates have grown still weaker and many mills will sell at 1.15e., Pittsburgh, though some of the large mills still adhere to 1.20c. In bars there is likewise business done at 1.15c., though not as large a proportion as in plates. Structural shapes are still held at 1.20e., but there is not enough new business going to test the market.

Pig Iron—The market continues absolutely stagnant. Even with the considerable decrease in merchant furnace production that occurred two or three weeks ago shipments are hardly up to production and it is not improbable that production will have to be eurtailed further. Of new buying there is hardly any. Priees apparently are well maintained at old levels: Bessemer, $14; basic, $13; malleable and No. 2 foundry, $13@13.25; gray forge, $12.50@12.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The English makers have reduced their priee on ferromanganese for forward delivery to $75, Baltimore, and there is resale material also offered at this priee. Russia has removed the embargo on ferromanganese export shipments. Shipments are fairly good on old contracts with the English produeers, and with the present reduced steel production, and prospects of further reductions the last thing that worries steel produeers is the ferromanganese supply.

Imports and Exports of Iron Ore in the United States six months ended June 30, long tons:

	1913	1914	Changes
Imports	1,136,153	709,046	D. 427,107
Exports	320,535	282,903	D. 37,632

Imports of manganese ore for the six months were 190,867 tons in 1913 and 135,089 in 1914; decrease, 55,778 tons this year.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 243,695 short tons; shipments, 256,537 tons. Production of Greensburg and Upper Connellsville districts, 37,354 tons.

Coal and coke tonnage of Pennsylvania R.R. lines east of Pittsburgh and Erie eight months ended Aug. 31, short tons:

	1913	1914	Changes
Anthracite	6,851,626	7,153,407	I. 301,781
Bituminous	33,396,286	31,821,349	D. 1,574,937
Coke	9,731,462	6,867,676	D. 2,863,786
Total	49,979,374	45,842,432	D. 4,136,942

The total decrease this year was 8.3%, the heaviest loss being in the eoke tonnage.

Mining Companies—United States

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt.
Acacia, g.	Colo.	1,438,989	$ 1	$ 122,004	Jan '11	$0.01
Adams, s.l.c.	Colo.	80,000	10	778,000	Dec. '09	0.04
Ahmeek, c.	Mich.	50,000	25	2,230,000	July '14	2.00
Alaska Mexican, g.	Alas.	180,000	5	3,381,381	Aug. '14	0.20
Alaska Treadwell, g.	Alas.	200,000	25	14,485,000	Aug. '14	1.00
Alaska United, g.	Alas.	180,200	5	1,702,880	Aug. '14	0.20
Am. Zinc, Lead & Sm.	U. S.	168,640	25	983,320	Jan. '14	0.50
Anaconda, c.	Mont.	4,992,500	25	91,413,750	July '14	0.75
Argonaut, g.	Calif.	200,000	5	1,500,000	July '13	1.50
Arizona Copper, pf.	Ariz.	1,426,120	1.20	1,950,242	Apr. '14	.....
Arizona Copper, com.	Ariz.	1,519,896	1.20	16,815,497	July '14	0.30
Bagdad-Chase, g., pf.	Calif.	84,819	5	202,394	Jan. '09	0.10
Baltic, c.	Mich.	100,000	25	7,950,000	Dec. '13	2.00
Bingham N. H., c.	Utah	228,690	5	385,695	Apr. '14	0.10
Bonanza Dev., g.	Colo.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g.	Calif.	200,000	1	856,000	Aug. '14	0.05
Bunker Hill & Sul., l.s.	Ida.	327,000	10	15,383,250	Aug. '14	0.25
Butte-Alex Scott, c.	Mont.	74,000	10	148,000	Oct. '13	0.50
Butte & Ballaklava, c.	Mont.	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	Ida.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	Ariz.	616,758	10	20,632,831	June '14	1.25
Calumet & Hecla, c.	Mich.	100,000	25	124,250,000	June '14	5.00
Camp Bird, g.s.	Colo.	1,100,051	5	9,861,942	July '14	0.24
Centen'l-Eur., l.s.g.c.	Utah	100,000	5	4,050,000	Apr. '14	1.50
Center Creek, l.z.	Mo.	100,000	10	505,000	July '14	0.05
Champion, c.	Mich.	100,000	25	8,400,000	Oct. '13	1.00
Chief Consolidated, s.g.l.	Utah	876,764	1	262,969	Aug. '14	0.05
Chino, c.	New Mex.	864,820	5	5,135,370	June '14	0.75
Cliff, g.	Utah	300,000	1	90,000	Jan. '13	0.10
Cliff, g.	Alas.	100,000	1	210,000	Oct. '13	0.01
Colo. Gold Dredging	Colo.	100,000	10	550,000	Jan. '14	2.50
Colorado, l.s.g.	Utah	1,000,000	0.20	2,570,000	Dec. '12	0.03
Columbus Con., g.s.	Utah	285,540	5	226,832	Oct. '07	0.20
Commercial Gold	Ore.	1,750,000	1	43,750	Dec. '10	0.00½
Con. Mercur, g.	Utah	1,000,000	1	3,445,313	July '13	0.03
Continental, z.l.	Mo.	22,000	25	319,000	July '14	0.50
Copper Range Con., c.	Mich.	393,692	100	13,986,746	Oct. '13	0.75
Daly Judge, s.l.	Utah	300,000	1	810,000	July '14	0.15
Daly West, s.l.	Utah	180,000	20	6,606,000	Jan. '13	0.15
Doctor Jackpot, g.	Colo.	3,000,000	0.10	45,000	Mar. '11	0.00½
Doe Run, l.	Mo.	65,783	100	3,550,969	Dec. '13	0.76
Eagle & Blue Bell, g.s.l.	Utah	893,146	1	267,943	Aug. '14	0.05
Elkton Con., g.	Colo.	2,500,000	1	3,379,460	May '14	0.02
El Paso, g.	Colo.	490,000	5	1,757,545	Aug. '14	0.10
Ernestine, g.s.	N.M.	300,000	5	165,000	Mar. '13	0.05
Fed. M. & S., com.	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	Idaho	120,000	100	8,747,226	June '14	1.50
Florence, g.	Nev.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	Nev.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g.	Calif.	200,000	2.50	244,000	Aug. '14	0.02
Frontier, z.	Wis.	1,250	100	146,202	Nov. '13	2.00
Gemini-Key'ne, l.g.s.	Utah	5,000	100	2,280,000	June '14	10.00
Gold Chain, g.	Utah	1,000,000	1	130,000	May '13	0.03
Gold Coin of Victor.	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	Colo.	2,500,000	0.10	100,000	Dec. '12	0.00½
Gold King Con., g.	Colo.	5,750,370	1	1,407,319	ec. '11	0.03
Golden Cycle, g.	Colo.	1,500,000	5	2,955,000	Aug. '14	0.03
Golden Star, g.	Ariz.	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g.	Nev.	3,558,367	10	27,398,214	Apr. '14	0.30
Grand Central, g.	Utah	500,000	1	1,595,750	May '14	0.05
Granite, g.	Colo.	1,650,000	1	269,500	Nov. '12	0.01
Hazel, g.	Cal.	900,000	1	971,000	Dec. '13	0.01
Hecla, l.s.	Idaho	1,000,000	0.25	3,110,000	Aug. '14	0.02
Hercules, l.s.	Idaho	1,000,000	1	3,650,000	July '11	0.06
Homestake, g.	S. D.	218,400	100	35,577,994	Aug. '14	0.65
Horn Silver, l.s.z.	Utah	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	216,832	July '13	0.00½
Iowa-Tiger Leasing g.s.	Colo.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	Utah	1,000,000	0.10	2,070,000	Aug. '14	0.10
Iron Silver, s.l.g.	Colo.	500,000	20	4,900,000	Apr. '14	0.10
Jamison, g.	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	Colo.	2,500,000	0.10	175,000	Aug. '12	0.01
Kendall, g.	Mont.	500,000	5	1,505,000	July '14	0.06
Kennedy, g.	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. '09	0.12
Klar Pigmette, z.l.	Wis.	20,000	1	187,500	Apr. '13	0.50
Knob Hill, g.	Wash.	1,000,000	1	45,000	May '12	0.00½
Liberty Bell, g.	Colo.	133,552	5	1,559,179	Sept. '13	....
Little Bell, l.s.	Utah	300,000	1	75,000	Mar. '11	0.05
Little Florence, g.	Nev.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	Utah	400,000	25	2,300,000	July '13	0.05
Mary McKinney, g.	Colo.	1,309,252	1	1,169,308	July '14	0.02
May Day, g.s.l.	Utah	800,000	0.25	132,000	Feb. '13	0.03
Mexican, g.s.	Nev.	201,600	2.50	161,910	June '14	0.75
Miami, c.	Ariz.	746,759	5	3,732,249	Aug. '14	0.50
Modoc, g.s.	Colo.	500,000	1	275,000	Dec. '11	0.01
Mohawk, c.	Mich.	100,000	25	3,275,000	Aug. '14	2.00
Monarch-Mad'a, g.s.l.	Colo.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g.	Nev.	921,865	1	530,000	Dec. '12	0.10
Mountain, c.	Cal.	250,000	25	4,216,250	May '08	0.44
National, g.	Nev.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	Nev.	1,999,524	5	16,226,911	June '14	0.37½
New Century, s.l.	Mo.	330,000	1	237,600	Oct. '09	0.01
New Idria, q.	Cal.	100,000	5	1,740,000	Apr. '14	0.10
North Butte, c.	Mont.	410,000	15	11,890,000	July '14	0.50
North Star, g.	Cal.	250,000	10	4,262,040	June '14	0.30
Old Domin'n, M. & Sm.	Ariz.	162,000	25	3,969,000	July '14	1.25
Ophir, s.g.	Nev.	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	Utah	898,978	0.25	80,907	Jan. '13	0.02
Oroville Dredging	Cal.	700,000	5	1,453,086	Aug. '14	0.12
Osceola, c.	Mich.	96,150	25	12,179,675	July '14	1.00
Parrot, c.	Mont.	229,850	10	7,393,562	Aug. '14	0.15
Pearl Con., g.	Wash.	1,909,711	0.05	181,422	Dec. '10	0.02
Pharmacist, g.	Colo.	1,500,000	1	87,500	Feb. '10	0.00½
Pioneer, g.	Alas.	5,000,000	1	2,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	Iad.	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g	Nev.	2,790,000	1	771,200	July '14	0.02
Portland, g.	Colo.	3,000,000	1	9,697,080	July '14	0.02
Quilp	Wash.	1,500,000	1	67,500	Feb. '12	0.01
Quincy, c.	Mich.	110,000	25	20,952,500	Dec. '13	1.25
Ray, c.	Ariz.	1,454,304	10	2,720,832	June '14	0.37½

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt
Republic, g.	Wash.	1,000,000	1	85,000	Dec. '10	0.01½
Rochester, l.s.	Mo.	4,900	100	188,396	Dec. '10	0.50
Round Mountain, g.	Nev.	866,426	$ 1	$ 363,365	Aug. '13	$0.04
Seven Troughs Coal., g.	Nev.	1,500,000	1	37,500	July '12	0.02½
St. Joseph, l.	Mo.	1,472,252	10	9,279,180	June '14	0.05
Shannon, c.	Ariz.	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c.	Ariz.	350,000	10	2,100,000	July '14	0.50
Silver King Coal., l.s.	Utah	1,250,000	5	2,534,085	Apr. '14	0.15
Sioux Con., s.l.g.	Utah	745,389	1	872,097	July '11	0.04
Skidoo, g.	Cal.	1,000,000	5	325,000	Aug. '14	0.02½
Snowstorm, c.g.	Ida.	1,500,000	1	1,192,103	Oct. '13	0.02
South Eureka, g.	Calif.	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s.	Cal.	178,394	10	5,274,407	Nov. '13	0.25
Stratton's Ind., g.	Colo.	1,000,000	0.60	546,750	May '14	0.06
Success, z.	Ida.	1,500,000	1	925,000	May '13	0.02
Superior & Pitts., c.	Ariz.	1,499,792	10	7,179,028	June '14	0.38
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	4,156,250	June '14	0.75
Tomboy, g.s.	Colo.	310,000	4.85	3,482,905	June '14	0.48
Tom Reed, g.	Ariz.	909,555	1	2,045,372	Aug. '14	0.06
Tonopah Belm't, s.g.	Nev.	1,500,000	1	6,508,000	July '14	0.25
Tonopah Ext., g.s.	Nev.	943,433	1	566,060	July '14	0.07½
Tonopah of Nev., s.g.	Nev.	1,000,000	1	11,850,000	July '14	0.25
Tri-Mountain, c.	Mich.	100,000	25	1,450,000	Dec. '13	2.00
Tuolumne, c.	Mont.	800,000	1	520,000	May '13	0.10
Uncle Sam, g.s.l.	Utah	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	Wash.	1,000,000	1	40,000	Nov. '12	0.01
United (Crip. Ck.) g.	Colo.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c.	Ariz.	23,000	10	1,886,000	July '14	4.00
United Verde, c.	Ariz.	300,000	10	34,822,000	Aug. '14	0.75
Utah, s.l.	Utah	100,000	10	281,860	Dec. '10	0.02
Utah, c.	Utah	1,624,290	10	23,371,079	June '14	0.75
Utah Con., c.	Utah	300,000	5	8,400,000	July '14	0.50
Valley View, g.	Colo.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	Utah	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	Colo.	1,500,000	1	2,947,000	July '14	0.03
Wasp No. 2, g.	S. D.	500,000	1	451,965	Aug. '14	0.01
Wellington Mines, g.	Colo.	10,000,000	1	400,000	July '14	0.00½
Wolverine, c.	Mich.	60,000	25	7,740,000	Apr. '13	5.00
Work, g.	Colo.	1,500,000	1	172,500	July '08	0.00½
Yak, s.l.	Colo.	1,000,000	1	1,757,685	Mar. '14	0.02
Yankee Con., g.s.	Utah	1,000,000	1	167,500	Jan. '13	0.01
Yellow Aster, g.	Cal.	100,000	10	1,154,789	July '13	0.03
Yellow Pine, l.z.s.	Nev.	1,000,000	1	403,008	June '14	0.02
Yukon Gold, g.	Alas.	3,500,000	5	6,037,500	June '14	0.07½

Iron, Industrial and Holding Companies

Amalgamated, c.	Mont.	1,538,879	100	$91,380,147	Aug. '14	$1.50
Am. Sm. & Ref., com.	U. S.	500,000	100	26,333,333	June '14	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	48,208,333	June '14	1.75
Am. Smelters, pf. A.	U. S.	170,000	100	8,895,000	July '14	1.50
Am. Smelters, pf. B.	U. S.	300,000	100	13,462,000	July '14	1.25
Greene Cananea	U. S.	486,302	100	4,365,646	June '14	1.00
Guggenheim Expl.	U. S.	380,315	25	20,393,701	July '14	0.87½
Inter'l Nickel, com.	U. S.	115,826	100	12,950,172	June '14	2.50
Inter'l Nickel, pfd.	U. S.	89,126	100	8,091,113	Aug. '14	1.50
National Lead, com.	N. Y.	206,554	100	8,106,055	June '14	0.75
National Lead, pf.	N. Y.	243,676	100	28,963,779	June '14	1.75
Old Dominion, c.	Ariz.	293,245	25	5,633,697	July '14	1.00
Phelps, Dodge & Co.	U. S.	450,000	100	33,971,527	June '14	4.00
U. S. Steel Corp., com.	U. S.	5,083,025	100	213,465,145	June '14	1.25
U. S. Steel Corp., pf.	U. S.	3,602,811	100	363,988,417	Aug. '14	1.75
U. S. S., R. & M., com.	U.S.-Mex.	486,348	50	6,362,181	July '14	0.75
U. S. S., R. & M., pf.	U.S.-Mex.	351,114	50	14,241,857	July '14	0.87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s.	Mex.	50,000	$ 5	$ 212,500	Oct. '12	$0.25
Amparo, g.s.	Mex.	2,000,000	1	1,460,884	Aug. '14	0.03
B. C. Copper	B. C.	591,709	5	615,198	Jan. '13	0.15
Beaver Con., s.	Ont.	1,996,490	1	469,888	July '14	0.03
Buffalo, s.	Ont.	1,000,000	1	2,757,000	July '14	0.03
Canadian Goldfields, g.	B. C.	600,000	0.10	237,099	Jan. '14	0.001½
Chontalpan, g.s.l.z.	Mex.	7,000	25	63,000	May '14	0.75
Cobalt Townsite, s.	Ont.	1,000,000	1	1,180,000	May '14	0.48
Coniagas, s.	Ont.	800,000	5	6,400,000	May '14	0.45
Con. M. & S. Co. of Can	B. C.	58,052	100	1,592,501	July '14	2.00
Crown Reserve, s.	Ont.	1,768,814	1	5,819,397	Aug. '14	0.02
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0.25
Dos Estrellas, g.s.	Mex.	300,000	0.50	9,885,000	Sept. '13	1.25
El Oro, g.s.	Mex.	1,147,500	4.85	8,947,261	July '13	0.24
Esperanza, s.g.	Mex.	455,000	4.85	11,996,303	Jan. '14	0.24
Granby, s.l.c.	B.C.	148,496	100	5,533,357	June '14	1.50
Greene Con., c.	Mex.	1,000,000	10	9,044,400	May '14	0.50
Guanajuato D., pf., s.	Mex.	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold	B. C.	120,000	10	1,353,520	June '14	1.50
Hollinger, g.	Ont.	600,000	5	2,160,000	Aug. '14	0.15
Kerr Lake s.	Ont.	600,000	5	5,220,000	June '14	0.25
La Rose Con., s.	Ont.	1,498,627	5	4,787,669	July '14	0.25
Le Roi No. 2, g.	B. C.	120,000	24.30	1,472,580	Jan. '13	0.36
Lucky Tiger Com., g.	Mex.	715,337	10	2,506,134	Aug. '14	0.09
McK.-Dar. Sav. s.	Ont.	2,247,692	1	4,270,609	July '14	0.06
Mines Co. of Am. (new)	Mex.	1,700,000	10	*1,215,000	July '13	0.12½
N. Y. & Hond. Ros., g.	C. A.	150,000	10	3,410,000	July '14	0.20
Nipissing, s.	Ont.	1,200,000	5	12,090,000	July '14	0.25
Peñoles, s.l.g.	Mex.	80,000	25	6,361,688	June '13	1.25
Peregrina M. & M., pf.	Mex.	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s.	Mex.	20,000	100	660,000	Apr. '12	3.00
Right of Way Mnsts.	Ont.	1,685,500	1	202,260	Dec. '11	0.02
Rio Plata, s.	Mex.	374,518	5	345,745	Feb. '13	0.05
San Rafael, g.s.	Mex.	2,400	25	1,441,180	Oct. '13	0.50
San Toy, g.s.	Mex.	5,750,000	1	530,000	July '13	0.01
Sorpresa, g.s.	Mex.	19,200	20	3,979,240	Jan. '11	34.00
Stand'd Silver-Lead.	B. C.	2,000,000	1	1,455,000	Aug. '14	0.05
Timiskaming, s.	Ont.	2,500,000	1	1,534,155	Apr. '13	0.06
Tem. & Hud. Bay, s.	Ont.	7,761	1	1,916,967	June '14	3.00
Trethewey, s.	Ont.	1,000,000	1	1,961,998	July '14	0.05
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	637,465	Oct. '13	0.05

*Previous to reorganization, $5,258,881.
†Previous to January, 1910, $324,644.

Fuel Exports of Great Britain eight months ended Aug. 31, in long tons:

	1913	1914	Changes
Coal	48,320,608	44,257,161	D. 4,063,447
Coke	712,698	694,061	D. 18,637
Briquettes	1,363,324	1,324,937	D. 38,387
Steamer coal	13,720,560	13,249,027	D. 471,533
Total	64,117,190	59,525,186	D. 4,592,004

The decrease shown this year was mainly in the month of August, when there was a loss of 2,110,052 tons in exports and of 602,470 tons in coal sent abroad for the use of steamships in foreign trade.

SAULT STE. MARIE CANALS

The total freight passing the Sault Ste. Marie Canals in July was 8,830,256 short tons. For the season to Aug. 1, the total tonnage was: Eastbound, 17,939,685; westbound, 7,741,288; total, 25,680,973 net tons, a decrease of 11,992,514 tons from last year. The total number of vessel passages was 8872, giving an average cargo of 2895 tons. Mineral freights included in the totals were, in short tons, except salt, which is in barrels:

	1913	1914	Changes
Coal	9,412,435	7,040,372	D. 2,372,063
Iron ore	23,344,042	14,739,927	D. 8,604,115
Pig and m'f'd iron	198,762	142,116	D. 56,646
Copper	46,967	30,087	D. 16,880
Building stone	5,973	.....	D. 5,973
Salt, bbl.	335,136	403,331	I. 68,195

Iron ore was 57.4% and coal 37.4% of the total freight this year. Of the coal reported this year, 1,133,532 tons were anthracite and 5,906,840 tons bituminous.

CHEMICALS

NEW YORK—Sept. 30

The general market is still unsettled and rather uneasy, and business is rather limited.

Arsenic—The market is slow and quiet. Prices are nominally unchanged, at $4.50 per 100 lb. for both spot and futures.

Copper Sulphate—Business continues fair. Prices are steady at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The market has been dull for the past week. Quotations are rather nominal at 1.95c. per lb. for all positions.

Potash Salts—A dispatch from U. S. Consul C. B. Hunt, at Barcelona, says: "Potash deposits over 250,000 acres discovered three years ago, near Barcelona, owned by Rene Macavi, Cours Victor Hugo, 80, Bordeaux, France. Product not yet commercially available. Work on property interrupted by war. Under most favorable circumstances, export not possible for 10 months."

Assessments

Company	Delinq.	Sale	Amt.
Best & Belcher, Nev. (post.)	Sept. 25	Oct. 16	$0.05
Black Bear, Ida. (post.)	Oct. 1	Nov. 1	0.01
Black Traveler, Ida	Sept. 22	Oct. 24	0.005
Bullwhacker, Mont	.....	.. ..	0.15
Carney Copper, Ida	Sept. 21	Oct. 21	0.00225
Cedar Creek, Ida	Sept. 10	Oct. 10	0.003
Chalona, Nev	Oct. 3	Oct. 21	0.0025
Coeur d'Alene Investment, Ida	Oct. 10	Nov. 14	0.002
Columbine, Colo	Sept. 15	Oct. 20	0.02
Comstock Copper, Ida	Oct. 5	Nov. 5	0.001
Continental, Ida	Oct. 6	Nov. 5	0.016
Copper Crown, Ida	Oct. 10	Nov. 14	0.002
Copper King, Ida	Oct. 1	Nov. 1	0.01
Dalmatia, Ida	Oct. 1	Nov. 2	0.001
Davis-Daly, Mont	Oct. 15	.....	0.25
Diamondfield Black Butte, Nev	Sept. 15	Oct. 15	0.01
East Hercules, Ida	Oct. 1	Nov. 1	0.001
Emerald, Utah	Sept. 15	Oct. 10	0.0033
Eureka, Ida	Sept. 25	Oct. 26	0.001
Federal Ely, Nev	Sept. 21	Oct. 21	0.005
Giant, Ida	Sept. 21	Oct. 23	0.003
Honolulu, Ida	Sept. 15	Oct. 12	0.0025
Lead King, Ida	Oct. 1	Oct. 16	0.0005
Lewis & Clark, Ida	Sept. 15	Nov. 13	0.001
Liquidator, Ida	Sept. 12	Oct. 12	0.002
Lucky Swede, Ida	Sept. 19	Oct. 19	0.001
Monarch-Pittsburgh, Nev. (post.)	Sept. 14	Oct. 19	0.01
Nabob, Ida	Oct. 1	Nov. 2	0.005
National Copper, Ida	Oct. 5	Nov. 5	0.03
Orange-Manhattan, Nev	Sept. 12	Oct. 10	0.01
Overman, Nev	Oct. 8	Oct. 29	0.05
Pacific, Utah	Oct. 5	Oct. 21	0.0025
Reindeer-Queen, Ida	Sept. 21	Oct. 21	0.002
Rescue Eula, Nev	Sept. 10	Oct. 15	0.01
Royal Mining, Ida	Sept. 23	Oct. 19	0.0015
Silver Pick, Nev	Sept. 14	Oct. 19	0.01
Snowshoe, Ida	Sept. 19	Oct. 19	0.005
Sonora, Ida	Sept. 28	Oct. 27	0.002
Sunset, Nev	Sept. 21	Oct. 26	0.01
Tar Baby, Utah	Sept. 3	Oct. 5	0.005
Tarbox, Ida	Sept. 26	Oct. 26	0.0025
Tonopah Gipsy Queen, Nev	Sept. 2	Oct. 17	0.01
Treasure Vault, Ida	Sept. 15	Oct. 12	0 02
Umatilla, Nev	Sept. 3	Oct. 8	0.01
United Copper, Wash	.....	.....	0.005
Valentine, Ida	Sept. 12	Oct. 12	0.001

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1912	1913	1914	1912	1913	1914
January	56.260	62.938	57.572	25.887	28.983	26.553
February	59.043	61.642	57.506	27.190	28.357	26.573
March	58.375	57.870	58.067	26.875	26.669	26.788
April	59.207	59.490	58.519	28.284	27.416	26.958
May	60.880	60.361	58.175	28.038	27.825	26.704
June	61.290	58.990	56.471	28.215	27.199	25.948
July	60.654	58.721	54.678	27.919	27.074	25.219
August	61.606	59.293	54.344	28.375	27.335	25.979
September	63.078	60.640	53.290	29.088	27.986	24.274
October	63.471	60.792	.....	29.299	28.083	.....
November	62.792	58.995	.....	29.012	27.263	.....
December	63.365	57.760	.....	29.320	26.720	.....
Year	60.835	59.791	.....	28.042	27.576	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York		London			
	Electrolytic		Standard		Best Selected	
	1913	1914	1913	1914	1913	1914
January	16.488	14.223	71.741	64.304	77.750	69.488
February	14.971	14.491	65.519	65.259	71.575	70.188
March	14.713	14.131	65.329	64.776	70.658	69.170
April	15.291	14.211	68.111	64.747	74.273	69.313
May	15.436	13.996	68.807	63.182	74.774	67.786
June	14.672	13.603	67.140	61.336	70.821	66.274
July	14.190	13.223	64.166	60.540	69.446	64.955
August	15.400	‡	69.200	‡	74.313	‡
September	16.328	‡	73.125	‡	78.614	‡
October	16.337	.....	73.383	.....	79.250	.....
November	15.182	.....	68.275	.....	73.825	.....
December	14.224	.....	65.223	.....	69.583	.....
Year	15.269	.....	68.335	.....	73.740	.....

New York, cents per pound, London, pounds sterling per long ton. ‡Not reported.

TIN

Month	New York		London	
	1913	1914	1913	1913
January	50.298	37.779	238.273	171.905
February	48.766	39.830	220.140	181.556
March	46.832	38.038	213.615	173.619
April	49.115	36.154	224.159	163.963
May	49.038	33.300	224.143	150.702
June	44.820	30.577	207.208	138.321
July	40.260	31.707	183.511	142.517
August	41.582	‡	188.731	.....
September	42.410	32.675	193.074	.....
October	40.462	.....	184.837	.....
November	39.310	.....	180.869	.....
December	37.635	.....	171.786	.....
Av. year	42.252	.....	206.279	.....

New York in cents per pound; London in pounds sterling per long ton. ‡Not reported.

LEAD

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	4.321	4.111	4.171	4.011	17.114	19.665
February	4.325	4.048	4.175	3.937	16.550	19.606
March	4.327	3.979	4.177	3.850	15.977	19.651
April	4.381	3.810	4.242	3.688	17.397	18.225
May	4.342	3.900	4.226	3.800	16.623	16.503
June	4.325	3.900	4.190	3.810	20.226	19.211
July	4.353	3.891	4.223	3.738	20.068	19.051
August	4.624	3.875	4.550	3.715	20.406	.....
September	4.698	3.826	4.579	3.658	20.645	.....
October	4.402	.....	4.253	.....	20.302	.....
November	4.293	.....	4.146	.....	19.334	.....
December	4.047	.....	3.929	.....	17.798	.....
Year	4.370	.....	4.238	.....	18.743	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1913	1914	1913	1914	1913	1914
January	6.931	5.262	6.854	5.112	26.114	21.533
February	6.239	5.377	6.089	5.228	25.338	21.413
March	6.078	5.250	5.926	5.100	24.605	21.460
April	5.641	5.113	5.491	4.963	25.313	21.569
May	5.406	5.074	5.256	4.924	24.583	21.393
June	5.124	5.000	4.974	4.850	22.143	21.345
July	5.278	4.920	5.128	4.770	20.592	21.568
August	5.658	5.560	5.508	5.418	20.706	.....
September	5.694	5.380	5.544	5.230	21.148	.....
October	5.340	.....	5.188	.....	20.614	.....
November	5.229	.....	5.083	.....	20.581	.....
December	5.156	.....	5.004	.....	21.214	.....
Year	5.648	.....	5.504	.....	22.746	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1913	1914	1913	1914	1913	1914
January	$18.15	$14.94	$17.35	$13.25	$18.59	$13.99
February	18.15	15.06	17.22	14.12	18.13	14.08
March	18.15	15 07	16.96	13.94	17.53	14.10
April	17.90	14.90	16.71	13.90	16.40	14.13
May	17.68	14.90	15.80	13.90	15.40	14.27
June	17.14	14.90	15.40	13.90	15.10	13.96
July	16.31	14.90	15.13	13.90	14.74	13.90
August	16.63	14.90	15.00	13.90	14.88	14.90
September	16.65	14.90	15.04	13.90	14.93	14.03
October	16.60	.....	14.61	.....	14.80	.....
November	16.03	.....	15.91	.....	14.40	.....
December	15.71	.....	13.71	.....	14.28	.....
Year	$17.09	.....	$15.57	.....	$15.77	.....

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